SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

COMPRESSED AIR AS A POWER FOR UNDERGROUND PURPOSES IN COLLIERIES.

The value of compressed air in underground operations in mines is now recognised to a much greater extent than ever it has been, and is making its way very fast in all parts of the kingdom, more especially in connection with coal-cutting machinery. That it is highly advantageous will be gathered from the following notice of a very able and exhaustive paper with regard to the production of air, read by Mr. J. WARBURTON, at the meeting of the Midland Institute of Mining Engineers. Mr. Warburton stated that the conveniences of compressed air for underground uses were so great that it was a wonder that it had not been generally adopted, more particularly as it was by no means costly. It was the property of the elasticity of the air and the laws scientifically deduced from it that led them to expect much from its compression. The principal law was that the elasticity of air increased in exact proportion as its volume diminished. From that law it was deduced that the elasticity, or the force of the air, was equal to the pressure resting upon it. The deduction might be received as correct, but the former law, whilst it might be scientifically possible, practically he thought it open to question. The law was known as that of Boyle and Marriotte, and said that "the volume of an aeriform body was inversely as the pressure—*i.e.*, by doubling the pressure we half the volume, &c., but the elasticity is *increased directly* as the pressure—by doubling the pressure we double the elasticity—or, in other words, the rebounding force. The latter was a deduction which he questioned in its application to anything beyond the limits of a scientific experiment. The experiments, he believed, had been made by the ordinary glass tube, only open at one end, and when filled with atmosphere mercury was poured in at the open end, which drove or compressed the air up to the sealed end, and in proportion to the weight of mercury put into the volume diminished and retained its power to rebound when the pressure was removed. But the manner of applying the weight so gently increased, and acted so mildly on the same unit of air, together with the glass tube being a very bad conductor, there was not much loss of heat or power, consequently the law held good so far; but not so as they did at present, by compressing the air by an ordinary air-pump, only the valve separating the air compressed from the air to be compressed, the former, perhaps, up to 60 lbs. to the square inch, and the latter at 50lbs.

If the law held good that the elasticity increased directly as the density, their present mode of obtaining and storing would be very wasteful, on account of the violence or force of the "clashing together of the atoms." The force of (say) 60 lbs. to the inch, did not take place under circumstances slow, gentle, and gradual, like all power in nature; but harsh, violent, forcible, and consequently unnatural. All the air-pumps he had seen were surrounded by water, so arranged that a stream of cold could be constantly supplied as that surrounding it got warm and passed away. The water absorbed the heat that was made by the act of compression. Prof. Faraday had said, "the whole stock of energy or working power in the world consists of attractions, repulsions, and motions." If, then, they had all the stock of power, and where work was done it was the agency of one of the first increased or augmented by the third motion, or velocity. Air composed of the various gases possessed in a large degree the attribute of repulsion, and was in its natural state nearly always so circumstanced as to induce actively the third source of power—motion. Hence, they had air in constant motion, the latter giving heat to the molecules of air, and so developing the stored up power, and the result was a performance of work in moving the air from one place to another. Were there no exterior influences that would go on until the whole air would become heated to an enormous height; but by water and other bodies absorbing the heat thus evolved a reasonable average was preserved. It was that air they laid hands upon by compressing machinery and endeavoured to convert its tendency to expansion into one of compression, in the hope of storing up that power.

That a considerable amount of heat was evolved by the act of compression they were all aware, and if that measure of heat was the measure of the loss of the force of elasticity it must be a large percentage of loss. From the most scientific opinions, it would appear that the work they got from compressed air was not due to the force of expansion, or elasticity in the air, as its actual performance, but due to a pressure from behind. Such being the case, what was their position as to value given and value received? The only way that he could see to get at it was on the basis of the "mechanical equivalent of heat," one definition of which was "Heat requires for its production, and produces by its disappearance, 772 foot pounds for each unit of heat, the unit being the amount necessary to increase the temperature of 1 lb. of water by 1° Fahr." On their compressing air by a steam-engine working a compressing pump, the moment compression commenced heat was evolved, and the ratio of heat produced increased as the pressure of the air compressed. To find the amount of heat produced by compression, he had made some experiments with an air-pump, 18 in. diameter and 3 ft. stroke, an iron tank 3′ 6″ × 1′ 10″ × 2′ 2″, open at the top, encasing the pump. The tank was made water-tight, so that the cyliner of the pump might be surrounded by water, except about 5 in. by 3′ 6″. On the upper circle was cast the valve-pipe, which was above the level of the tank, and, therefore could not be immersed in water. The tank was filled with water, about 390 lbs., at a temperature of 60° Fahr. There was also a reservoir about 18 ft. from the pump, 45 ft. by 3 ft. diameter.

In 2 minutes	the pressure was	15 lbs.,	water	60°
7	"	"	40	"	64°
11	"	"	58	"	69°
15	"	"	60	"	74°
25	"	"	64	"	84°
40	"	"	46	"	96°
50	"	"	62	"	106°
65	"	"	89	"	120°

Thus in 65 minutes the 390 lbs. of water had been heated 60° by the compressing pump. According to the mechanical equivalent of heat there had been produced or heated 390 lbs. of water 60° higher, which would be represented by the following—390 × 60 × 772 ÷ 33,000 = 547-horse power, leaving out the fractions. These figures looked enormous, and so they were to have produced 547-horse power in 65 minutes without being able to economise a single pound of it. The 547-horse power was what was produced by the mechanical act of compression, but a second loss of power was in the air that was compressed being deprived of that amount of heat, which was, in fact, an equivalent loss of elastic force. If his bases were right, and his conclusions also, they had a loss of actual mechanical production of unavailable power equal to 547-horse-power, a loss by the disappearance of that amount of heat from the air they were to use as the power, which in the 65 minutes would be 547 more, amounting in all to 1094-horse power. But he did not think that represented all the loss, seeing that although the valves and pipes leading from the pump to the re ervoir were not immersed in water, yet the pipes in open road, and exposed to a current of cold air, sent the thermometer up to 150° in five minutes. The surface of the pipes at that temperature was more than that of the air cylinder which was immersed; and had a similar amount of water surrounded them he believed it would have been heated to the same degree. But if he took half of that, and added 547 to 1094, they had 1641-horse power lost, and that without the friction in transmission from the reservoir to the place where it had to be made use of, as the actual ex penditure through the steam-engine during the 65 minutes which had given such a loss. He had had the revolutions of the engine and the pressure of steam carefully noted during the time, and found they put through the engine 2275-horse power, or about 27 per cent. available horse-power, less the friction in transmission to its destination.

FIRTH AND HURD'S PATENT WEIGHTED DIFFERENTIAL LEVER AIR COMPRESSOR.

To what use may not compressed air as a motive-power be economically and advantageously applied, is a question which as yet appears not to have been mooted, but the improvements recently made in the engines for its production have been such that before long it will become one of primary importance. That air-power will be made available for purposes at present little dreamt of appears to be tolerably certain, and that, too, before any great lapse of time. Just now it is being adopted at several collieries in Yorkshire in connection principally with coal-cutting machinery, and for which it appears to be pre-eminently suited, as well as for drawing minerals along inclines in mines, as well as for pumping purposes.

In working in collieries by means of compressed air where the coal is cut by machinery, the great advantage of the compressed air system is that by means of it the ventilation is greatly improved, especially at the working faces, as the exhaust air from the machines during the whole time they are at work deliver a supply of fresh air entirely free from noxious gas, whilst the coldness of the discharged air, consequent upon its expansion at the moment of its liberation, has the immediate effect of reducing the temperature at the face of the coal, and rendering the working places remarkably cool and healthy for the men.

Of the few engineers who have directed their attention to the best means for producing engines for compressing air Messrs. FIRTH and HURD have been among the most successful, and have taken out several patents for improvements connected with them, having several of their engines working. They have also been very successful in the perfecting of machines for cutting coal by compressed air-power, and some of them are now in operation at West Ardsley, Thorncliffe, Wooley, and Wharncliffe Silkstone Collieries, well known in the West Riding of Yorkshire. In the producing of engines for compressing air Messrs. Firth and Hurst have sought to obtain that power at a minimum cost of steam, and have succeeded in doing so, as proved by some recent experiments. Amongst the skilful mechanical appliances they have brought into requisition is that of a weighted differential lever, and in applying the power to the longer arm of the lever, in connecting the shorter arm to the machinery for compressing, and in applying the pressure of air as a governor. The piston rods of the cylinders is connected to the crank pin, which is connected to the larger arm of the differential lever by a link, the shorter arm being in communication with the force-pump, the compressed air from which is discharged through orifices into a pipe connected to the receiver. The air from the receiver passes through another pipe to the self-registering pressure and weight gauge, consisting of a stationary plate with corresponding openings. The air from the receiver passes through an elbow pipe to the face of the piston, and regulates the position of the plate referred to, according to the working pressure determined upon. The air, after passing through the self-registering pressure and weight guage, is conveyed through a pipe to the excavating machine—where such is worked—a branch pipe being in communication with the engines by which the air is compressed. By this arrangment the compressed air in excess of that required for working any machines is conveyed back to the motive-power engine. By such means about 3 lbs. of compressed air is obtained at an expenditure of 1 lb. of steam; and even more by the weighted differential lever, the steam being simply required to raise the lever to a vertical position to obtain a large increase of power. By the velocity and weight of the lever the power is increased by each course of the stroke, the lever itself being thus the real compressor of the air. In obtaining air-power the steam-engine is so connected with the differential lever of the compressor as to receive its greatest force at the instant the lever is being raised to its vertical position, not so much power being required to bring back the lever to its vertical position, as a sufficient quantity of air is left between the face of the piston and the end of the cylinder in giving the turning point to the lever. When extra pressure is required the steam can be applied at the moment when it is at its greatest power, and so assisting the lever in compressing.

One of the most powerful engines yet produced has recently been put down at the collieries of the West Ardsley Company, near Leeds, having been made by Mr. Hurd, at the Albion Ironworks, Wakefield, on the principle patented by him and Mr. Firth, and is intended not only to work several coal-cutting machines, but to aid in the making of the oil produced by the shale from the pits. The air-cylinder is 22 in. in diameter, and the cylinder of the steam-engine worked in connection with it is about 17 in. diameter. The weight of the lever is between 4 and 5 tons. Recently some interesting experiments have been made in testing the power of the engine, which were most satisfactory, the result being that with about 20 lbs. of steam 65 lbs. of air pressure was obtained with considerable ease, the air-compressor even then not being worked to anything like its full limit, the escape valve at the time being tightly closed down. The air-compressor alluded to consists of two cylinders, horizontal to each other, tied together by massive strong slides, the weighted differential lever striding them in a vertical position, and mounted on substantial cast-iron framework. The valves are adjusted in such a manner that there is little or no noise during the working of the compressor, the whole forming a simple and powerful as well as a rather stupendous piece of machinery, well adapted for many other purposes besides those connected with mining operations.

Amongst the various ways in which the air-power could be applied is that for the propelling of omnibuses, carts, and other vehicles, heavily laden or otherwise, and Mr. Hurd is now engaged in perfecting a system for that purpose, and which would effect a very large saving when compared with ordinary horse-power. For such a purpose it would be necessary to erect in some central place a powerful compressing engine, the same as if gasworks were about to be erected, with a large receiver, or airometer, pipes, &c. Mr. Hurd proposes that the latter should be laid on the surface of the streets, and constructed in such a manner that they would become a cheap and enduring roadway, or pavements, or gutters, as might be desired. The air could be taken from different points, to suit the convenience of consumers; whilst any defects in the pipes, or leakage, could be not only easily discovered, but remedied at a comparatively trifling cost seeing that there would be no opening of the ground, as is the case at present with regard to gas and water mains.

Mr. Hurd is now engaged in preparing a series of models, showing the means by which he proposes to carry out his system. The effect of travelling—more especially on tramways—would not only be far more pleasant than at present, more expeditious, but would effect a great saving, whilst the motive-power would be easier of control than horse-power. The cost of an air cylinder, it may be said, would not be more than than that of a ordinary steam-engine, in proportion to the size and power of the cylinders. Should such a system be adopted, Mr. Hurd considers the air from the same source as supplied to vehicles might easily be made available for the supply of private persons requiring a small or large quantity of power. The air could be taken to the points where it was required with very little trouble or cost. If the places or persons likely to take the power and the quantity required could be ascertained there would be no difficulty in putting down pipes of the necessary diameter, and ensuring to consumers a uniform pressure of not less than 50 lbs. to the square inch. The air-compressing engine could also be adopted for underground purposes by exhaustion were such required—by reversing the valves. The views and perfected plans of the system proposed by Mr. Hurd for doing away with horse-power in our public and other conveyances will shortly be brought more fully before those interested in such a complete revolution of our street locomotion. We understand that Mr. Hurd has taken the preliminary steps for obtaining a patent for such a system as that we have noticed in regard to air-power for vehicles, and surface mains in connection with it. That a good deal of discussion will be elicited, as well as opposition, admits of no doubt, but there is every reason to believe that Mr. Hurd's views will stand the test of practical examination.

MANUFACTURING INDUSTRY OF SCOTLAND.

MESSRS. R. LAIDLAW AND SON'S GAS ENGINEERING WORKS.

In the Supplement to the *Mining Journal* of Dec. 2 appeared an article on the works of the Patent Frictional Gearing Company, in Glasgow, of which Mr. Robert Laidlaw is the head. It is, however, as a gas engineer that that gentleman is most widely known, and we promised to return to the subject of his works and contracts in this department. With reference to the latter, we may inform our readers that in 1868 Messrs. Laidlaw and Son erected for the Metropolitan Gas Company, St. Petersburg, gas works extending to 350 retorts, with 4 telescopic gas holders and wrought-iron tanks (one gas holder 130 ft. diameter by 50 ft. deep, containing about 600,000 cubic ft. of gas; two gas holders, each 100 ft. by 40 ft. = to about 300,000 cubic ft.; one gas holder, 60 ft. by 40 ft. = to about 120,000 cubic ft.), and other apparatus of corresponding dimensions. These works are capable of producing 1,900,000 cubic ft. in 24 hours, and their production may be extended to 3,000,000 per 24 hours. For the Moscow gasworks, Messrs. Laidlaw and Son have supplied very extensive plant, including 4 telescopic gas holders, outer lift 102 ft. diameter, by 21 ft. deep; inner lift 100 ft. diameter, by 21 ft. deep. For the Dundee Gas Company's works they have supplied a tank 102 ft. diameter and 25 ft. 3 in. deep, and a holder constructed on the telescopic principle, capable of containing upwards of 370,000 cubic ft., with other machinery; while they have supplied the greater part of the plant belonging to the Glasgow Corporation Gasworks. These are only a few of the works which the Messrs. Laidlaw have executed, and it is worthy of remark that they have on hand large orders for the lighting of Yokohama and Yeddo, in Japan.

The Edinburgh works of Messrs. R. Laidlaw and Son are situated in Simon-square, Nicolson-street, and cover 3000 square yards. All the buildings are three storeys in height, and upwards of 300 hands are employed in all the departments. In these works gas meters, gas burners, block-tin tubing, and all the internal fittings of gas-works are manufactured. Paraffin and petroleum lamps are also a speciality at these works; the firm having made for many years all the lamps and burners used by Young's Paraffin Light and Mineral Oil Company, from sheet brass. As an illustration of the large extent to which the manufacture of these lamps is carried on, we may mention that Mr. David Laidlaw, in giving evidence before the Court of Session, in a case in which Mr. Young, the inventor of paraffin oil, sought to obtain damages from the Clydesdale Chemical Company for an infringement of his patent, stated that in 1860 the firm supplied no less than 247,431 lamps to Mr. Young, and for many years the Edinburgh works have turned out on an average from 1000 to 1200 lamps per day. These lamps are of simple construction, containing the oil in a reservoir below, from which the wick rises by capillary attraction. As there are no features calling for special remark about the Edinburgh establishment, we turn our attention to the

Broomhill Ironworks, Port Dundas, which were acquired some years ago by Messrs. R. Laidlaw and Son, with a view to carrying on more extensively the manufacture of cast-iron pipes and hydraulic mains. The Broomhill works are conveniently near to the Alliance foundry, which we described last week, and where the chief offices of the firm are centred. They cover upwards of 6000 square yards of ground

area, and are fitted up with machinery specially adapted for the production, on a very large scale, of pipes for water and gas of all sorts and sizes. The *modus operandi* of moulding the pipes is very ingenious and simple, and the process is the patent, we believe, of Mr. Stewart, of St. Rollox, Glasgow. After being cast in dry sand, the pipes are put into a mould, vertical in form, inside which a long spindle is made to revolve, as in the case of boring a cylinder. These moulds are of various sizes, according to the size of the pipe wanted, the largest being 4 ft. and the smallest 6 in. diameter. The cores are made in a graduating series of boxes and rollers, from 6 in. and upwards in size; and the *materiel* used in their construction is a fine mixture of clay and sand. There are two large cupolas attached to the foundry, in which the pig-iron is melted. The mouth of the cupola is on a level with a roomy platform, to which the pig-iron is lifted by means of a hoist. Throughout the foundry there are several lines of rails, on which carriages are run, conveying the moulds from one process to another, until they are finally deposited in the drying stoves. There are altogether six drying stoves, each 26 ft. long, and here the moulds are allowed to remain for a longer or shorter period in proportion to the size of the casting. Sometimes three pipes are got from a mould in a day, but there are always two, except when accidents occur. After the pipes have been separated from the cores they are tested by hydraulic pressure, by a very efficient process, which gives a uniform pressure of from 300 to 400 lbs. The press is worked by means of a screw, and the water is contained in a high-level tank of ample dimensions in a corner of the yard. Finally, after having successfully resisted the ordeal of hydraulic pressure—which, by the way, is a great improvement on the old system of testing—the pipes are dipped in tanks containing Dr. Angus's patent solution, to which they are lifted by cranes, and in which they are allowed to remain until they become as hot as the pitch itself.

Attached to the Broomhill Ironworks there are engineering shops for the manufacture of turning and boring pipe joints, and for making gas and water slide valves, core boxes, and other appliances used in the foundry department. The whole of the machinery throughout the works is driven by a crank overhead engine of 100-horse power, to which two horizontal two-flued boilers are attached. As showing the extent to which Messrs. Laidlaw carry on this department of their business, we may state that they have supplied 675 tons of pipes for the Preston Gasworks; 600 tons of pipes for the Brighton and Hove Gas Company; 4000 tons of water-pipes from 3 in. to 16 in. diameter for the Victoria water supply; and they have also supplied the Preston, Liverpool, Glasgow, St. Petersburg, the Hastings and St. Leonard's, and other gas companies, with large contracts of pipes, all within the last three years.

No description of the works and operations of Messrs. Laidlaw and Sons would be complete without a reference to the new market which they have just supplied for Santiago. According to the plans for this structure, as prepared by the joint architects Mr. T. W. Goodman and Mr. Driver, the material employed both for constructive and decorative purposes is almost entirely cast-iron—wrought-iron being used for little more than the bolts and tie-rods. Ornamental effect has been carefully studied throughout. Nine separate roofs at various heights have been erected, in addition to a low corridor roof next the butcher's stalls, the central and highest roof being surmounted by a small dome. The angles are occupied by four roofs of less height, which, like the central roof, are hipped each way, and the fine pavilions thus formed have their louvred faces well exposed to the air. The covering of the roofs is galvanised Italian corrugated iron, which differs from ordinary corrugated iron in having wide plain faces, with the corrugations some inches apart. The iron used is No. 18 B.W.G., and before being galvanised or corrugated weighed 90 ozs. to the foot super. The castings were all arranged in short lengths for packing, and the ornamental castings were mostly cast separate from the structural pieces. The structure has been almost entirely bolted together, the number of bolts used amounting to 34,288, while there were 77,472 holes requiring to be punched.

WITH WHAT ARE THE STRATA ABOUT PRODUCTIVE COPPER LODES MINERALISED?

SIR,—In pursuance of this subject, and harmonising with my previous remarks in relation thereto, and keeping in mind the pertinency of interrogation involved in the above heading, it may be proper to say some of our richest copper and other lodes are encased in granites, which do not by analysis contain any of the metallic ingredients found to characterise the body of the veins they enclose. From whence, then, it may be asked, are the metals derived?—and the answer can only be, from other sources and through other channels; as it is well known that such channels always abound in good mining districts in the various forms of porphery, clay, greenstone, and other dykes. It sometimes happens, as in the case of the Cobre Mines of Cuba, that the waters of some of the richest mines contain the greatest percentage of copper in solution, and large quantities have from time to time been extracted therefrom by precipitation. It unfortunately happens, however, that the waters of some of the poorest mines, such as the Duke of Cornwall, situate between Lostwithiel and Bodmin, are highly charged with copper in solution; and in other instances in Cornwall I have seen the strata in copper mines which would not pay for working abundantly charged with the green carbonates of copper.

As motion is one of the essential conditions of matter, it follows that all material things are progressive, but not *ad infinitum*—there is a limit, a point of maturity or perfection, to which they attain, and thence immediately retrogression commences, and proceeds until all which was formed is again unformed, disintegrated, or dissolved, according to the properties of the several ingredients entering into the composition and constituting the specific embodiment, whatever it may have been. If these views are susceptible of general application, as they unquestionably are in individual cases, there must, then, be a remarkable, if not striking, analogy between the animal, vegetable, and mineral kingdoms in this respect, and, if so, the perfection of the lodes and the maturity of their combinations would seem to indicate depletion of the metallic products of the strata in fulfilment of physical or organic functions until absolute exhaustion thereof became the prelude of disintegration and dissolution, and, consequently, give rise to a new order of combinations and effects. From this it would appear that a profound knowledge of physics is necessary to determine from the condition of the strata the value of the lodes contained therein, and such knowledge, it may be observed, is extremely difficult of attainment.

I have not the least doubt but it would be found, after the most cautious and critical examination of the strata encasing the several classes of lodes, if the tests are fairly made, so as to secure a good average, that many an unprofitably worked lode would be found to wear a far richer clothing than some of the most productive lodes hitherto discovered. It seems to me irrational to conclude, as things exist and disclose themselves to our view, that the metals can predominate in the lode and strata at the same time.

It requires no very elaborate preparation nor a very extensive knowledge of chemistry to satisfactorily test mineral waters, and also the various classes of rocks, to ascertain the presence, and even the percentage, of all the useful metals contained therein. But if the foregoing views are correct and applicable to any appreciable extent, of what value as a guide to practical mining could such information possibly be? If it is known to practical experience—and I affirm that it is—that certain strata surrounding finely-formed copper lodes are densely charged with the salts of copper, carbonates exuding from its every pore, whilst the lodes themselves are too poor to pay for working, some other lights or evidences as prospects of successful mining must be looked for, and relied upon.

I was not fortunate enough to see Capt. Ennor's communications on this subject, but presume from my knowledge personally of that gentleman's abilities as a practical miner, and his shrewdly observant tendency of mind, that his principal object was to call attention to and correct an error, which it is to be presumed was becoming too general—the employment of vague or meaningless terms in mining reports. I have known the terms "highly mineralised strata" used in cases where not the slightest evidence ocularly existed of any metallic ingredients either saturating or impregnating the containing rocks, and of which no scientific tests had ever been made, and the only reason which could conceivably be assigned for the use of such terms was the presence interstratially of small particles of the sulphuret of iron—yellow mundic.

I had not for some time the least inclination or intention of obtruding upon you any remarks of mine upon this subject; but as it has been considered sufficiently important to evoke some expression week after week in the columns of the Journal, I concluded that every person interested in mining who has directed thought and observation to such or any other fact, of natural science, ought to state candidly his views to the mining public, as, if it leads to no other result, it may be the means of inducing attention and closer observation to the subject generally. ROBERT KNAPP.

Elsworth, Nye County, Nevada, Nov. 23.

THE BRAZILIAN MINING COMPANIES.

SIR,—I have followed for many years, with great interest, your valuable articles referring to Mining in Brazil, not only from my long acquaintance with the province of Minas Geraes, the principal centre of mining, but also from the large interest I have held for the last 40 years, and principally in those mines formed within the last seven years, through the influence of a gentleman recently arrived from Brazil, and referred to in the Journal of Sept. 23, headed "Entertainment to Capt. Thomas Treloar." The glowing description of the spontaneous and enthusiastic manifestation of esteem and regard as shown by the inhabitants of Itabira to this gentleman on his departure for England may read well to those unacquainted with the history of Brazilian mining, and particularly those undertakings with which the above gentleman has been most directly connected. To myself, and I feel sure other shareholders of the various companies now in existence, it will, however, read otherwise.

We are reminded of the long service rendered by him to the St. John del Rey Mining Company during a period of 17 years. Such a term is far too long to sift through, but it is a well-known fact that after the said company had lost his valuable services, under the indefatigable management of their able manager, Mr. Gordon, the shares rose from 30*l.* to 59*l.* We now come to the Don Pedro North del Rey. The results derived from the former have, as you correctly state, come almost on a par with the triumphs obtained in the exploration of mines. But to whom is the praise due? Surely not to Capt. Treloar, for I must inform you that the origin of the company was solely the working of a large quartz formation known as the Morro St. Ana Mines. These after two years proved to be worthless, and had it not been for the pressing and frequent requests of several Brazilians who knew the history of Maquine from tradition, they themselves assisting in its exploration, the great success of Capt. Treloar would have been cut short, as he at that time was on the eve of abandoning everything, and himself too. The trial proved a fortunate one, and the results obtained are well known to all.

It is an old saying that a good mine makes a model of a superintendent, and so far true, for how many companies have since been formed on the strength of the wonderful ability and skill of the above gentleman—Anglo-Brazilian, Rossa Grande, Sao Vicente, Taquaril, and, lastly, General Brazilian. What have been the results, Mr. Editor? Unfortunately, they are too well known—direct failure, and the expenditure of nearly half a million sterling without hardly any result. At Itabira, I think the least the inhabitants could have done was to provide and make known to the world the advantage they had derived from the expenditure of nearly 150,000*l.* during the existence of the company.

The adit from which we are told to expect unknown and invaluable riches is yet far from completion, not mentioning the miles of watercourse still unmade ere water of any quality can be brought to the mines. These, combined with the nearly insurmountable difficulties in reaching the old workings, all tend to show that had the motto placed over the great benefactor's head at the Itabira dinner been read instead "the wrong man in the right place," it would, I think, have been more befitting.

It is a long lane that has no turning, and I am pleased at last to find that the London management are doing as they have ever done—their best towards remedying this sad state of affairs, by the appointment of new blood in the management of their local affairs. Would that it had taken place years ago! Even in the short space of months radical changes are to be seen in the present system of mining. Two of the mines have already been resuscitated—Sao Vicente and Anglo-Brazilian—the former now holding out every prospect of success, the latter already on the right side of cost, and with fair promise of profits for the future.

If any praise is due, I think it would be more fittingly on the two gentlemen now in charge of the above companies, who have achieved in a short time what Capt. Treloar, with his staff, failed to do in seven years. A SUBSCRIBER.

SILVER MINING ON THE PACIFIC COAST OF AMERICA.

SIR,—It is impossible to deny that in most of the mineral districts of the Pacific Coast there are mines of gold, silver, copper, lead, &c., which show ore of an extrordinarily rich character; nevertheless it is equally apparent that by far the greatest source of wealth will be derived from what are locally termed "low grade ores." In every mining camp the following practical remark is heard continually, "When $20 silver rock will pay for working, we have as much money in sight as we want."

Two things are now accomplished which will result in bringing about this consummation, and perhaps in a shorter time than is anticipated. These are improved methods of working silver ores, and the reduction in cost of wages, provisions, machinery, &c., by the introduction of the narrow gauge (29 inches) railroad. A line of this kind, 65 miles in length, was opened this summer, running from Denver to the very heart of the Rocky Mountains. This miniature line—an imitation, I believe, of one in Wales—with its miniature engines and cars, appears the solution of the difficult problem, "how to navigate mountainous regions." Col. Greenwood, the chief engineer, assured me the entire cost of this line was not more than $14,000 per mile, though it passed through some of the most difficult country in the State. Every mining camp of importance will soon have the means of making connection with one of the three grand trunk lines of railway traversing the western part of the continent of America. This, of course, implies reduction in cost of labour, food, and plant.

Some silver mines are known to contain large quantities of native silver which may, and ought to be, subjected to the operation of smelting; but by far the largest amount is in such a state of combination as to require special metallurgic operations to reduce it. On a subject of such vital importance experiments for the reduction of silver ores have been very numerous, and it is impossible to take up a newspaper from any mining district without finding descriptions of new devices for reducing and roasting ores, all claiming to surpass everything else before introduced. Actual operations now, however, prove that the Stetefeldt furnace answers to a very great extent the objects of the inventor. As far as the "patent" is concerned, it appears probable that it can scarcely be sustained except as regards the peculiar and ingenious apparatus by which the ore, reduced to a very fine powder, is sprinkled into the top of the flue.

It is, however, to Stetefeldt we are indebted for proving the fact that silver ores can be desulphurised and chloridised, when reduced to a fine powder, and mixed with common salt, merely by bringing them into contact with flame—that is, in the almost incredibly short time occupied by the falling of the ore down a chimney 25 ft. high, the flame very slightly retarding the descent. Daily experience, however, proves this to be a fact. I fear your space would not allow me to give a detailed description of the furnace and the roasting process, but I will briefly allude to the chemical changes which take place. As soon as the ore—finely powdered, and mixed with a certain amount of common salt—comes in contact with the flame each sulphuret particle ignites, being surrounded by a glowing atmosphere, evolving sulphur, which in the presence of atmospheric air entering through the grate is converted into sulphurous acid, and the metal into an oxide. In contact with air the sulphurous acid absorbs oxygen and becomes sulphuric acid; but this does not combine with metal to form a sulphate, as it does to such a great extent in the reverberatory furnace; but the sulphuric acid turns its force against the finely divided particles of common salt, setting free its chlorine.

All these reactions are instantaneous, the gases acting in accordance with their well-known laws when in a nascent condition. The chlorine unites with the silver, producing the desired result of chlorination. Chlorides of the base metals, if present, are formed at the same time; but in this furnace many which are volatile are carried off, and the remainder, all of which are soluble in water (while chloride of silver is insoluble), may be easily got rid of by washing, or what is technically termed the "leaching process." The practical advantages of this furnace are:—

1.—The great saving of expense in roasting the ore.

2.—Its efficient chloridising power—up to 85 or 95 per cent.

3.—Its efficiency not depending on the *unremitting care* of the furnacemen.

4.—The simplicity of its arrangements and construction.

5.—Its comparatively small cost.

6.—Less salt and fuel required, as there is no waste.

Illustrative of its saving in expense, it is only necessary to compare it with the old reverberatory furnace, as shown at Reno, where I witnessed its operation.

The furnace was roasting 20 tons per day, and it took six men to attend to it. The cost is as follows:—

Labour—6 men, at $3 per day	$18·00	
Wood—3 cords, at $6 per cord	18·00	
Salt—1800 lbs., at 1½ c. per lb.	27·00	= $63·00

20 tons = $65·00 = $3·25 per ton.

To roast 20 tons per day in reverberatory furnaces will require 10 furnaces and 36 men:—

Labour—36 men, at $3 per day	$108·00	
Wood—10 cords, at $6 per cord	60·00	
Salt—2700 lbs., at 1½ c. per lb.	40·50	= $208·50

20 tons = 208·50 = $10·42 per ton.

To show the importance of a cheap chloridising roasting, it is only necessary to refer summarily to the most important silver ores—*important* because found in such vast quantities. For the sake of brevity, silver ores as found on the Pacific Coast have been classed as follows:—

I.—REAL SILVER ORES. II.—ARGENTIFEROUS ORES.

I.—REAL SILVER ORES:—

a.—Sulphuret of silver, or silver glance. Contains from 70 to 85 per cent. of silver, and is probably the only sulphuret of silver suitable for pan amalgamation without roasting. It is not an uncommon ore, but is often found carrying other sulphurets of a more intractable character, from which it is impossible to separate it.

b.—Brittle silver ore, or sulphuret of silver and antimony. This is a very common ore of silver, and averages about 65 per cent.

c.—Polybasite. A sulphuret of silver, containing antimony and a little arsenic. Both these are somewhat tractable in pans, without roasting, but are seldom, in this case, worked up to more than 45 to 50 per cent. of their value. All the sulphurets of silver ought to be roasted, even silver glance, by such a cheap method as Stetefeldt's will pay well for roasting.

d.—Rich silver. The dark-red silver ore, or antimonial variety; and the light-red silver ore, or arsenical variety. These are very valuable silver ores, easily desulphurised and chloridesed, and are found in vast quantities.

e.—Miangyrite, Stomeyerite, Stetefeldite, and Partizite are common and well known in Nevada, Idaho, and Montana, and all require roasting, but are not very refractory.

f.—Horn, or chloride silver. Contains, on an average, from 70 to 80 per cent., and is prepared by nature for pan amalgamation when found pure.

II.—ARGENTIFEROUS ORES:—

a.—Silver fahl, or argentiferous grey copper ore. It contains silver in variable proportions—an average is about 25 per cent. It is a common ore, but one of the most rebellious. It contains copper, antimony, arsenic, sulphur, lead, iron, and zinc, and occasionally gold and quicksilver. This ore is common, and, therefore, of considerable importance, and it is one to which the Stetefeldt furnace is particularly adapted. It occurs in considerable quantities in the copper mines of Utah; but, as these ores are best treated by the smelting process, the silver has to be extracted from the matt.

b.—Argentiferous lead ores. Silver-lead glance, or galena.

c.—Cerusite, or carbonate ores, containing silver and lead.

d.—Argentiferous zinc blende, sulphuret of zinc, and sulphuret of silver. Occasionally found to contain $500 to $600 to the ton in silver, though generally it is not considered a rich silver ore.

e.—Argentiferous pyrites. Copper and iron pyrites are poor in silver, but often carry gold. Pyrite is a valuable companion of silver ores, which require a chloridising agent, on account of the sulphur contained in it.

Argentiferous lead ores and cerusite, when pure, are best reduced by smelting. They are, however, found occasionally with sulphurets and antimonial sulphurets of silver, but do not interfere with the chlorodising process in the Stetefeldt furnace—a point of great importance.—*Upper Norwood, Dec. 20.* EDWARD BISHOP, M.D.

A TRIP TO BINGHAM CANON, UTAH.

SIR,—The mining interests of Utah, and more especially of the district round Bingham Canon, have often been referred to in the columns of the *Mining Journal;* and as I had an opportunity lately to again visit that canon, I send you the following notes, which may, perhaps, interest some of your readers.

On entering the mouth of the canon the long flumes, with their numerous lengths of hose, now limp and pendant for want of water, mark the beginning of the placer washings, which extend, though somewhat interrupted, up the canon to the boundary of the Utah Silver Mining Company's property, where, by the bye, some rich samples of gold quartz have been obtained *in situ;* and also up Bear Gulch, between the Excellenza and No you Don't Mines, in the direction of Butterfield Canon, where promising gold-bearing ledges have lately been exposed. At the town of Bingham, but at an elevation of some 300 ft. above it, the old bed of the canon is still preserved, and there is there found, mixed with the great boulders of quartzite and gneiss and smaller boulders of quartz and iron ore that choked its course, sufficient pay dirt to make it worth working. The old ravine, no doubt, choked when the great lake still stood at an elevation of some 700 ft. above its present level, which elevation the wide terraces that flank the foothills surrounding its borders clearly demonstrate to have been its landwash for a considerable period at some past epoch in its history. Above the town there is a well-defined belt of copper-stained rock, some 500 feet in thickness, and the water that filters through it flows into the canon, carrying off some of the copper in solution. This copper is re-deposited in a dendiform manner with the solution infiltrating bark and other organic matter met with in the bed of the defile.

Higher up there succeeds the great belt of quartzite, traversed by several dykes of elvan, in which occur the vast deposits of silver-bearing lead ores that give to Bingham its high reputation as a mining camp. In the western portion is situated the Jordan property and that of the Utah Silver Mining Company, which adjoins the Spanish Mine, the source of so large a quantity of carbonate ore at the present time; while its eastern extension, rising from the very borders of the plain, contains that valuable property but lately developed, and now bonded with some other excellent claims by Mr. Henry Sewell for an English company. It is appropriately named the Yosemite, and as the Californian always thinks of his big trees and immense precipices of 3000 ft. and 4000 ft. in height when the Yosemite is mentioned, so the Utah miner speaks of this Yosemite as a "big thing," and will hereafter connect the name with his beau ideal of a perfect prospect, unless, indeed, he be of the same disposition as those old "'49-ers," who reserved the nuggets only of their weekly dividends, and threw away the fine gold, which they "regarded as of no account." The ledge, clearly defined for 7000 feet, shows near the surface carbonate ores, with galena nuclei, which in depth give place to solid galena. In the lowest level, 230 ft. from the surface, the galena shows 6 ft. in thickness, with an average of $50 in silver to the ton of ore.

To the courtesy of Mr. P. A. Eagle, secretary of the Utah Silver Mining Company, I am indebted for the opportunity of seeing that well-known property. The great masses of carbonate ores, which two months ago supplied nearly all the ore for the furnace, I found had almost altogether given place to galena, mixed with mundic. In the Red Warrior it showed a thickness of between 30 and 40 feet. For the proper working of this ore a calciner is absolutely necessary, and I noticed an oven in course of erection which is expected to answer the purpose. The small quantity of carbonate ore in sight would seem to point to the necessity of an immediate increase of working capital for the further development of the mine—an increase which Mr. Sewell, in his report, advised months ago; and the necessity for which is evidently finding credence, if the rumour about town is correct that Mr. Bateman has made a present of 500 shares to the company, to induce them to increase the working capital. The only other smelting-works in the canon are owned by Messrs. Bristol and Daggett, an American company. They have two furnaces in operation, and are now doing a satisfactory business. With a large stock

of fuel on hand, and with a supply of ore of various qualities, bought expressly to mix with their own and facilitate the smelting, they expect to have a successful winter's campaign. HENRY S. POOLE,

Salt Lake City, Nov. 23. Assoc. Royal School of Mines.

SWEETWATER MINES, WYOMING.

SIR,—As the Young America Mine occupies a prominent position among the rich ledges in this territory, I propose to make it the subject of this letter, giving at the same time a correct account of its development and yield.

This mine is really an extension of the Cariso, and is situated west of the western extremity of the Cariso, about one-eighth of a mile from South Pass City, and consists of 600 ft. running in a north-east and south-west direction. This mine is what is termed by miners a "blind ledge," so called on account of its being covered by a deposit of grey marl, containing granite, slate, and quartz boulders. The ledge was accidentally disclosed by a placer ditch which crossed it at its eastern extremity, and the water wearing away the deposit disclosed the mine, which was immediately located as the Young America. This mine was discovered in the early winter of 1868, by two miners, known in the mines as Blue Jay and Vinegar. These parties immediately sank a shaft on the east end of the claim, and extracted quite a large amount of quartz, which was crushed by the Hermit Mill, and yielded $134 per ton. Although the yield was in excess of their anticipations, yet the mine was found to be what is called a wet one, and they found that although they were making large profits they could not sink the shaft deeper without hoisting machinery. They being day labourers could not, of course, provide and erect even the cheapest kind, and were, therefore, compelled to dispose of the property, which they did to an Ohio company.

This company, coming into possession of the property, erected a 10-stamp mill, and also hoisting works, sinking a new perpendicular shaft west of the old discovery shaft, connecting the same by levels at different depths. The main working shaft, upon which the hoisting works are, is sunk to a depth of 85 ft., and is 9 by 5 in the clear, with two compartments. The discovery shaft is sunk to a depth of 55 ft., and is connected with the main shaft by a level 110 ft. long. At the bottom of the main shaft a good body of ore is disclosed, about 2 ft. in width, and a level has been run on the rise 70 feet east and about 10 feet west. The vein disclosed by this level is from 22 in. to 4 feet wide, and will vary in richness from $20 to $50 per ton. The hoisting works are of the Chicago Eagle Works manufacture, and consist of a stationary 15-horse power engine and boiler, and patent Californian brakes, with wire-rope. This mine is true fissure vein, with both walls well defined, and has an incline of about 75° north. The quartz is pure, showing fine gold in many instances. No sulphurets or other base metals have as yet been seen, and the gold is easily separated by the most simple and inexpensive mill process. The cost of mining a ton of this ore is about $10, and milling or reducing the same $3 more. The average yield, as shown by the books of the company, is about $23 per ton, which leaves a profit of $10 per ton average. It is estimated that there is now in sight, disclosed by the different levels, about 1000 tons of quartz, which can be easily raised at a slight expense.

This company is not operating at the mine at present, as their mill was accidently injured by a fire, and their means of reducing the ore destroyed; it is hoped, however, that as the mill can be repaired for about $3000 their suspension is but temporary. Before the injury to the mill about 400 tons of rock had been reduced, showing the average as above stated. With this record before them it is earnestly to be hoped that the company will not allow such a valuable property to remain long idle. M.

South Pass City, Wyoming, Nov. 21.

MINING IN THE WHITE PINE DISTRICT.

SIR,—I spent some months in the mining region of Eastern Nevada last summer, and had an ample opportunity to form an opinion on the mining business as carried on by Englishmen abroad. Not as an expert on mines do I speak, but as a business man. I think American experts, or the business men of White Pine, will be amused when they see Col. Bulkley's report on the ore reserves of the Eberhardt and Aurora Company's mines, or to know that he has been called upon to report at all. Col. Bulkley is a surveyor, and I am told this is his first effort in a new line. Surely Mr. Phillpotts could not suggest his making a report for circulation here. I will also call attention to a letter published in the Supplement to last week's Journal by Mr. Roche, who has an agent in White Pine. His agent says, "Yours of Oct. 21 is at hand; I thank you for the prompt answer, giving me the state of the London market, as it enabled me to take advantage of the market here, so as to dispose of the Nutmeg and El Capitan Mines for $90,000," &c. I have made enquiry of parties better acquainted with the White Pine district than I am (as I heard of no such mines), and cannot learn that any White Pine mines have been sold recently; at any rate, 100*l*. has been offered me for some London Charity if such mines exist in the White Pine district as the writer of that letter would have your readers infer, on proof that they have by a sale realised one-fourth of the amount stated.

I have nothing to do with the Eberhardt Company or its stock, but the reports we see publised here—not once, but week after week—are ridiculed by mine owners themselves; and as in the case of these White Pine Mines, and some of the Utah companies, the last "good thing," as I heard when out there, was some report on this or that mine owned in London. There are experienced mining experts, men employed by San Francisco capitalists to advise on ore reserves and prospects, but our companies too frequently employ men who would not be listened to by the San Francisco companies. If either Mr. Janin or Mr. Ashburner reported on the Eberhardt ore reserves, and made out one-half the quantity of $40 to $60 ore that is stated to be in sight, I should be glad to put some money in its stock, and notwithstanding Mr. Janin's great mistake in advising not to buy the Utah his report would be acceptable here. I was told in San Francisco that his fee would be about 125*l*. We all know that the ore in the Ward Beecher saved Eberhardt, and now it would be satisfactory to know what is really left. It is time for close investigation; money enough has gone out to America to bring back some dividends, and these operations should be carefully watched. Let the mines that earn dividends get the credit hereafter, and if American experts are to advise, let them be selected from men whose reputation at home stands higher than some of those whose reports have so fully occupied the *Mining Journal*. I have written to White Pine in regard to the Nutmeg and El Capitan mines, and shall report when the reply comes to hand. K.

London, Dec. 20.

MINING IN THE WHITE PINE DISTRICT, NEVADA.

SIR,—It is a rule in these days with many people not to be surprised at anything, nor to regard the most unlikely act as wholly incredible, a rule which your correspondent, G. W. Pizzey, whose letter appears in your Journal of to-day, would do well to adopt. The present is an age of scepticism, and it is becoming more so, so that something more definite and satisfactory will be required than the bare statement of another in order to get at the right thing to do. This doubt exists, and will increase in intensity day by day, more particularly as respects mining properties generally, in consequence of the great shams which have from time to time been palmed upon an unsuspicious public.

In the Supplement to last week's Journal Mr. G. W. Pizzey complains of your having given publicity to the letter signed "A Working Man," in the Journal of the 9th inst. Whether such publication was desirable it is not for me to define, but I beg permission to express an opinion that "A Working Man" is as much entitled to be heard, and as worthy of one's confidence, as many of those gentlemen whose names have appeared during the past 15 months on the several prospectus of these Nevada adventures.

It does not seem, at least to my weak understanding, that the Eberhardt and Aurora Company paying 30,000*l*. for water to work mines which, "A Working Man" says, are not themselves worth that amount, is any less credible than the facts in connection with another company's property in the immediate vicinity of the mines of the Eberhardt and Aurora Company. What are these facts? The price of the mine to which I refer was 300,000*l*., and it was bought to pay 20 per cent. Certainly not an excessive dividend for a property so far away. The prospectus of this company bore the names of two well-known and most respectable City gentlemen, who were to act as trustees for the shareholders in the matter, and to these two names the successful floating of the company was no doubt due. It was also set forth what the mine had done for its owners in the past, and that it must continue to yield equal, if not better, results in the future; in support of which it was clearly stated, in large type, "that the quantity of ore already developed above the deep tunnel will keep two mills of the capacity of the Stanford (30 stamps) fully employed for many years to come." This pleasant state of the case was given in the report on the mine in March, 1870, and positively confirmed by the same mining engineer in the month of October following; in addition to which a gentleman was sent from this country to inspect the property, and arrange for its proper transfer to the company. He, on his return, stated at the first ordinary meeting of the company, held in January last, "that he had fully satisfied himself the company was not paying anything like 21s. for 20s. worth of property," meaning, as I take it, that the mine was what it had been represented to be. Up to this point it seems as if nothing could have been more straightforward; yet, what have been the results? In six months after the inauguration of the company the supply of ore failed, and the two mills, one of which had yet no real existence, which were going to be employed on ore in sight for many years to come, ceased to run. Now, Mr. Editor, if such a state of things could happen in an undertaking ushered into the money world, as this one was, by gentlemen held in quite as high estimation as any of those who form the directorate of the Eberhardt and Aurora Company, it cannot be thought very extravagant on the part of "A Working Man" to ask the public to believe in the possibility of the directors of the Eberhardt and Aurora Company spending money which, for the good it will ever do the shareholders, might just as well be thrown into the sea.

"A Working Man" may have written his letter with a wrong motive, but if what he has alleged be *not* true, let those whose judgment and conduct he impugnes come forward and give, to all parties interested in the matters he has alluded to, the real truth.

To Mr. G. W. Pizzey I would say, in conclusion—Hope for the best; but do not be over-sanguine, for it is sufficiently patent that in following the lead of the most respectable and intelligent of men we are often finding ourselves on the losing side, to the special benefit of those who would make all who listen to them rich in a month.—*Manchester, Dec. 16.* ANOTHER WORKING MAN.

THE UTAH MINING COMPANY.

SIR,—The letter, by Mr. John R. Murphy, on "Mining Prospects in Utah, and the Utah Silver Mining Company, Bingham," which appeared in the Supplement to last week's *Mining Journal*, is a valuable addition to the information we already possess on these subjects. It will be satisfactory to those who are interested in mining enterprises in Utah to know that the prospects of success are so good that, in addition to the precious metals, there also exist in the district iron and coal (coal proper), which are both so necessary to the successful development of silver-lead mines, and that within a short period of time the district will be in close railway communication with Salt Lake City.

In writing his letter one of the objects Mr. Murphy had in view was to answer certain comments made by me in the *Mining Journal* of Oct. 28, on a letter written by Mr. Sewell on the "Utah Mining Company," and published in the *Mining Journal* of Oct. 21. I stated that on reading Mr. Sewell's letter I came to the conclusion that, instead of writing a private letter to one of the directors on the subject of working capital, he ought to have embodied his views on this subject in his formal report to the directors. In answer to this, Mr. Murphy says that Mr. Sewell was simply called in "as umpire, to determine on the merits of the company's mines as between Mr. Janin and Capt. Nancarrow," and "that he certainly would appear as intruding his good offices on the directors of the company had he done more than perform the duty for which he was called on at the time." This appears to me to be a most conclusive reason why Mr. Sewell should not have written the letter which appeared in the *Mining Journal* of Oct. 21, for the value of the mines would not have been affected even if nothing was ever taken out of them; and certainly opinions which might be considered intrusive at a time when they would have been of value to the company might fairly be considered much more so when published to the world some considerable time after. I am willing to admit that Mr. Sewell was influenced by no unworthy motive, but his letter was an unfortunate one, and did not aid the cause of foreign mining enterprise in this country, nor add to the reputation of mining experts. The morality of mining does not occupy so high a position in public estimation as it ought to do. A trifling circumstance will shake public confidence in new undertakings, and there are men eagerly watching for opportunities to depress and alarm timid shareholders so as to induce them to sell their shares. Mr. Sewell professedly writes to guard the public against "a reaction, which could only cause a panic," little thinking, perhaps, that he himself would be the primary cause of a reaction in the market value of the Utah Mining Company's property to the extent of about 50,000*l*.

In reference to the investment of English capital in Utah mines, Mr. Murphy praises the "slow and methodical system of prosecuting mining business" pursued by our "leading mining men," and says that "with such mining property in the hands of English capitalists as has been purchased by the Utah Silver Mining Company there can be no such word as fail, unless by the most stupid of blundering, and disregard of the necessary appliances and qualified skill to meet any chance or emergency possible to arise in the conducting of such enterprises." Mr. Murphy further says that "Mr. Sewell, Capt. Nancarrow, and Mr. Bateman wished to retain a continuation of my services at the works, having been remarkably successful in the reduction of the ores, producing daily from 5 to 6½ tons of bullion from the old furnace, but which for certain reasons I was obliged reluctantly to decline." If this was the average rate of production over a considerable period of time the old furnace, under the new management, has not been worked beyond half its full capacity, and the company has suffered a considerable loss of profit in the retirement of Mr. Murphy; sufficient, I imagine, to meet any necessary outlay in the thorough development of the mines to the full capacity of the two present furnaces.

As to the operations at the mines, the principal points at issue appear to be that, as a net annual profit of 100 per cent. was promised to the shareholders, by the vendors, negligence is attributed to the directors in not providing for this result at once by erecting three additional furnaces, of a capacity of 40 tons each, and by opening the mines to an extent sufficient to keep all these furnaces steadily going. I venture to ask if this would not be acting contrary to the "slow but sure methodical system," which Mr. Murphy praises in the operations of our "leading mining men?"

Mr. Murphy endorses Mr. Sewell's estimate that the old furnace will yield a net annual profit of 15,000*l*. The new furnace, which is completed, is of double the capacity of the old one, thus showing an annual net profit of 45,000*l*. "But," says Mr. Murphy, "a vast difference is certain to occur in the percentage of the metals in the ore when extracted, handled, and reduced in the large way (with four furnaces of 40 tons each, and one of 20 tons) over that of the small, making at least a difference of one-sixth, which would thus bring the reducing power only equal to the necessity of the case" (a net annual profit of 100 per cent.) On this basis the net annual profit from the two present furnaces, under good management, would be about 40 per cent. May I dare suggest to Mr. Murphy that a wise and prudent course to pursue, for the present, would be to vigorously work the mines up to this point, and in the meantime to construct one more 40-ton furnace without delay? The cost of this, and the opening of the mines sufficiently to keep these three furnaces steadily going would surely not require a large sum. With these three furnaces, and an efficient management, the annual net profit might be increased to 50 per cent., after allowing for stoppages and other contingencies which will arise. Other furnaces could be provided out of the profits as future necessity required. One of the fatal obstacles to permanent success in mining enterprise is the burdens of large capital at the outset. Many of the most promising concerns of the present time are overweighted in this way, and I think that the directors of the Utah Mining Company have exercised a wise discretion in keeping the capital of the company as small as possible.

Capt. Nancarrow has been too sanguine as to the time required to erect a 40-ton furnace in a new country like Utah. It is a work which cannot be done very rapidly even in England. We have heard so much of "next month" that those interested began to think that "next month" would never come. The new furnace is now completed; but there has been a snowstorm, and, although the company has a good stock of coal at Sandy Station, I fear that sufficient foresight has not been exercised in conveying the coal to the works. This is but a temporary drawback, which has no influence over the real value of the mines. All the reports go to prove that the mines are of great value and great extent, and under a vigorous working they will yield very large profits to the shareholders for a long time to come.

Doubtless no efforts will be spared to secure a thoroughly efficient management for all the company's operations. It will be impossible for the directors to satisfy everyone, but so much public attention has been drawn towards the undertaking that prompt and energetic measures on the part of the directors seem to be imperative. The remuneration of managers is of little moment as compared with integrity and efficiency.—*Dec. 21.* A. D.

THE UTAH MINE, AND ITS PROSPECTS.

SIR,—Nero fiddled whilst Rome was burning. A large number of sanguine shareholders appear to amuse their leisure moments by "figuring" out the high dividends that must inevitably shortly be paid by this company. This is, no doubt, quite a harmless gratification; but as nothing of the sort that has as yet been said about the Utah Mine has given the smallest indication of being even approximate to the truth, it is, unfortunately, not at present of much practical utility; in the meantime, as a commentary on these delightful anticipations, the shares fall steadily daily in the market. A friend who is interested in this mine tells me that on seeing his property going from bad to worse he called at the office to enquire if perchance anything had been heard lately that could account for the depression. He was informed that "the mine was looking well"—as if mines, forsooth, were liable to sudden changes of complexion, produced, I suppose, by indigestion, consequent upon swallowing too much of the shareholders' money. It is too ridiculous.

It is quite unnecessary, I think, in addressing you to make any apology for "schooling" the directors. *Humanum est errase.* It is presumed that they were deceived at first, like the rest of the shareholders, in supposing this mine to be what it was represented to be. We have all been "lying—under a mistake" for some months past; but it becomes more and more evident that the statement made at the meeting on Nov. 24 was not really so full an account of our position as it might have been. According to the statement then made by the Chairman, the shareholders were led to suppose that the new furnace we have heard so much of, and from which such great results were expected, *was completed*, and that there was, in fact, nothing left to do at the mine (we having already spent over 9000*l*., besides our three months' profits, amounting to about 1700*l*. more, in improving the property) but to work the two furnaces, and pay that 20 or 30 per cent. with which we are now recommended to content ourselves. Now, Sir, all the "bears" in Christendom, if there are any, will not suffice to depress a property about to commence paying 20 per cent. dividends, by 40 per cent. It is all nonsense referring it to that cause. The question is—*Is* the new furnace completed; will it ever be completed, and in a condition to work without fresh capital being raised, or spending all the profits (if there are any) of the old furnace? Nothing further has been published as regards the mine; but I have so strong a suspicion that it amounts in my mind to a certainty that these questions must be answered in the negative. It is not the least use mincing matters. This mine has had quite as much "trumpeting" as others, and more than most, and was for a long time believed to be a genuine paying concern. It is now apparently considered as great rubbish as any for which we are indebted to the good offices of the Stock Exchange. It is high time, therefore, that we should know the worst. If the directors want more capital it is their duty at once to call a meeting of the shareholders, and say so—that would be quite bad enough, but it would be better than muddling away what little profits available for dividends they may be able to make, and much better than the continuance of the uncertainty that surrounds this property at present. What *bona fide* holders wish to know is the real state of the property and its real prospects, and these are evidently not to be learnt from the trash that is published concerning it in the papers.

ANOTHER SHAREHOLDER.

UTAH SILVER MINE.

SIR,—Will you kindly allot me space for the insertion of the subjoined letter in the next issue of the Journal?

As one largely interested in the success of this company, being the holder of a number of shares purchased at 120 per cent. premium, I should be glad to learn the cause of the extraordinary depreciation in the shares of this alleged rich and valuable property. This mine, it will be remembered, was introduced to the public as something of more than ordinary value, and was represented by the vendors, and backed by the statements of the directors, to be in complete working order, and producing a net profit of upwards of 21,000*l*. per annum from the working of one furnace only. A capital of 10,000*l*., for the erection of four additional furnaces of like capacity, which it was represented could be in operation within 90 days from the completion of the purchase, was all that was asked to develope the resources of this wonderful mine to realise a net profit of 100,000*l*. per annum. This property being so very rich, the directors and their friends in the first instance secured all the shares to themselves, and afterwards issued them to the public at 40 to 50 per cent. prem.; and from the very flattering accounts continually published, the shares soon reached 150 per cent. premium.

On June 26, the day appointed for the shareholders' meeting to determine as to the purchase of this property, and after the sale and transfer of a large number of shares at the exorbitant prices above quoted, and the excitement had considerably abated, the Chairman (Mr. Kitching), in order to extinguish all doubts about their success, gave them a very comforting assurance to the effect that "Mr. Batters had telegraphed to the vendor, Mr. Bateman, offering him 10*l*. per share premium for 1000 shares," and Mr. Bateman's reply was—"I will not sell a share."

It must be apparent to all that the directors, who have made such a rich harvest out of this speculation, have very little confidence in the property at the present time, especially the chief promoter, or he would not lose the rare opportunity of enriching himself by purchasing his much-coveted 1000 shares, which he can now obtain for 15,000*l*. less than he offered for them as what he deemed their market value. It would appear that the Utah Mine is located in the poorest part of the territory, and far inferior to its neighbours in mineral wealth and in the quality and richness of its ore. A SHAREHOLDER.

Dec. 19.

"WHAT TO SELECT—WHAT TO AVOID"—No. IV.

SIR,—The intricate and difficult task I have set myself has scarcely commenced ere importunities pour in from every side, soliciting "what to avoid" rather than "what to select." Need I point out to my numerous interrogators that to enumerate by name the so-called mines that are ever and anon introduced to the consideration of that incongruous community known as the investing public would be invidious, thankless, unsatisfactory, inevitably arousing an irrepressible hornets' nest?

While a long experience has taught me that it should ever be the policy of those who, like myself, are entrusted with the responsibility of selecting legitimate channels for the employment of capital to exercise the utmost circumspection, and if erring it should be on the side of caution, while I say this should ever be the dominant principle, it is a question that I have not yet solved in my mind whether one would be altogether justified in "proclaiming upon the house-tops" which particular scheme should be avoided. Privately my duty is so to counsel and direct that "shoals and quicksands" shall not engulph the investor; publicly, I must go no farther than dictate caution. Mining is an alluring pursuit, leading, if properly directed, to the realisation of large profits. Its golden attractions, however, lead the inexperienced to catch at the shadow, and allow the substance to pass heedlessly by, the latter being presented with less glittering accompaniments; less is promised, but that less is abundantly and permanently realised.

A deaf ear should be turned to the undue extollation of one mine at the expense of another, for if the management be practical, the executive honest and economical, and the property situated in a proved mineral district, and without its capital being swallowed up by voracious vendors, the poor mine of to-day may become the rich mine of to-morrow. This has been, and still is being, strikingly exemplified in numerous instances, not the least of which is the case of Carn Brea, whose shares were sold at the beginning of the present year for 16*l*., and have since changed hands at 160*l*. The writer well recollects Great Wheal Vor shares being offered for the call of 5s., and within three months afterwards were sold at 42*l*.; and East Caradon at 1s. 6d. per share, which subsequently advanced to 55*l*. Numberless similar cases might be cited, but sufficient has been shown to support my proposition that, other circumstances being favourable, a mine should not be unequivocally condemned because of its temporary poverty. Enormous profits have been realised by the judicious purchaser of low-priced shares. Mines denounced have proved the greatest prizes, hence the absolute necessity of experienced and trustworthy advice.

SOUTH AURORA.—In referring to this mine last week, it was pointed out that the drifting operations were likely to result in an important discovery being made. Rumours have reached me that a rich vein has been struck, which is very probable, seeing the capricious manner in which these deposits are distributed. At this important juncture in the history of this mine it is pregnant with interest to know what the great authority, Mr. Hague, has put forward upon this point. I may mention that Mr. Ridsdale, the Chairman of the Eberhardt Company, who is no mean authority upon such matters, has stated that the most scientific and able description of these peculiar ore deposits is that given by Mr. Hague. Referring to South Aurora and its prospects, Mr. Hague says:—

"The great difficulty in prospecting is that the deposits are distributed so capriciously, so little in accordance with any law or system, that the miner has but few guides to lead him to the object of his search. Almost all the great discoveries here have been purely accidental. One of the best bodies of the North Aurora now being worked lies within 2 ft. of an exploring tunnel which was passed by without disclosing its presence. The Ward Beecher discovery is described as a fortunate accident, and some of the largest and best bodies have been found by following seams or branches of ore of small size and little promise. The whole experience of the mines on Treasure Hill shows that while the prospector must watch all indications with the closest scrutiny, following the spar seams, or feeders of ore, where they appear to guide him, yet the element of chance is after all the most important. Thus months may elapse before any great discoveries are made in the South Aurora; while, on the other hand, a fortunate strike may be made before this report reaches its destination. That large and rich deposits of ore still remain to be found seems to me by no means improbable."

So that shareholders in South Aurora need not despair. The proposed amalgamation of the Eberhardt and South Aurora companies is a matter well deserving the attention of both proprietaries. The

shareholders in South Aurora cannot dwell too much upon the announcement made by Colonel Bulkley in his recent report upon the Eberhardt Mines—that "the rich deposits (such as were taken from the Eberhardt and North Aurora Mines two years ago, and assayed $19,000 per ton), are not included in the estimated value of the masses. Both Eberhardt and North Aurora contain these rich deposits among the lower and more evenly distributed ores." The value of this statement to the shareholders in South Aurora is that their property is situated between the Eberhardt and North Aurora Mines, "which contain these rich deposits" among the lower strata, for it cannot be conceived that the superficial boundaries of the two contiguous mines shall have interfered with the intermediate mine, South Aurora, containing the same rich deposits.

WHEAL BULLER.—From what one can gather from different sources, it would seem that the importance of the addition of the Copper Hill Mine to the already extensive property of this company has not been sufficiently appreciated, nor have the shareholders, I think, adequately acknowledged the personal instrumentality and influence of their purser, Mr. Thomas Pryor, in having obtained such a valuable accession. It may not be generally known that Copper Hill originally formed a portion of Wheal Buller, and, when last worked, a strong opinion was entertained that, upon further development, it would prove of equal value to its rich neighbours. Its copper ore is of exceptional richness, which is of the greatest value in the improving condition of the copper market. As to Wheal Buller proper, that yielded such enormous profits in past years, it is opening out in a similar manner to the other great and productive tin mines in Cornwall. Those who can remember as far back as 1847 will recollect that a call of 5*l.* per 1-64th share was then made, amounting in the aggregate to 320*l.*, the expenditure of which resulted in a net profit of nearly 250,000*l.* in its return of copper. Like Dolcoath, Cook's Kitchen, and others, the copper has died out, and been replaced by tin, presenting indications of opening out a mine of great and permanent value.

1, *Pinner's-court, Old Broad street.* FREDK. W. MANSELL.

MINERAL RESOURCES OF IRELAND.

SIR,—The letter signed "Verax," in the Supplement to last week's Journal, seems to require an answer from some practical man who understands mining and the value of minerals.

As a Cornish miner of large practice, and as a captain of mines in Cornwall, Wales, and Cumberland, the Isle of Man, and, lastly, the Knockmahon Mines, in Ireland, I beg to say that I have examined carefully the bed of hematite ore on the Curraune estate, and am willing to put on shipboard 500 tons a-day at 2*s.* a ton; and if this were done for the next hundred years it would not work out the vast bed of first-class hematite iron existing at this spot.

Your readers will be able to calculate what the freightage of this ore will cost to the furnaces of England. My impression is that it will not be more than 7*s.* a ton. The value of this hematite ore at the furnaces is 25*s.* per ton, or, in other words, a profit varying from 75,000*l.* to 100,000*l.* per annum.

With these facts before the public surely it cannot be long before a good company can be found, with capital enough to work this bed of ore, when, so far as iron alone is concerned, justice will be done to the vast bed of hematite now lying dormant for want of proper development. GEORGE DAVEY.

Westport, County Mayo, Dec. 19.

WORKING TIN MINES.

SIR,—I desire to give a hint to the adventurers of Cornish mines, as to the mode practised by some of our mine agents.

Some of them are of opinion that because Dolcoath, Tincroft, and a few other mines have a large lode, and impregnated with tin throughout, nothing better can be done than to stope the lode from wall to wall, preparing it for market, and leaving a handsome profit. I say, because they do this, they do the same even when the lode is small and subject to bunches of tin, without testing the stuff from each stope separately, sending it away pell mell, good and bad altogether, taking the sample from one large pile, the produce of half a dozen or half a score of stopes; when, if each stope were assayed separately, it would show its value, and doubtless one quarter of the stuff so piled together would prove worthless, and be thrown away after they had gone to the cost of breaking it.

Although it makes men indolent, and is ruinous to adventurers, the great secret and fact of the case is, it is less labour on the part of agents to work a mine on "owners' account," tutwork, allowing everything good and bad to go together; setting month by month stents, judging the price by what was earned last month, so as to let things take their own course, whether profitable or no.

"Legitimate tutwork"—that is, to work the ground that will pay and to search out the ground that will not pay—and the tribute system, require a great deal of attention and labour, and is by far the most profitable to the proprietors. Say a mine working on a false system of tutwork will return 2000 tons of tinstuff monthly, and 500 tons can be reduced on the right principle, which it is more than probable can be effected, and the same quantity of tin returned—

1st, breaking of the stuff, 500 tons at 12s.	£300	0	0
2nd, tramming and hauling, at 8d.	16	13	4
3rd, sampling and putting to stamps, at 9d.	18	15	0
4th, stamping and dressing, at 1s. 6d.	37	10	0
Making for the month	£372	18	4
			3
And for the quarter	£1118	15	0

Economy in Cornish mining is of the utmost possible importance, I, therefore, send you these few lines for publication. A MINER.

MINING BY ACT OF PARLIAMENT.

SIR,—When the illustrious Scribelerus Mundungus, of happy memory, conceived the sublime notion of making himself known even to the limited sphere wherein he had been cast by some accident he never could account for, he acknowledged himself puzzled. How to break the shell of his obscurity was to him a problem most difficult to solve. He found it, so saith his record, "a poser;" and the world would have missed his existence altogether had not the thought struck him that the best way, because to him the most suitable, was to abuse his neighbours; and it has been handed down to posterity that he "straight-away did so, with the most virulent assiduity, but, nevertheless, it never made his fortune."

Now, Sir, without misusing, as some have done, the privilege of having a space accorded to me in your columns, I may venture to remark that a certain portion of the correspondence in your Journal of the 9th inst. goes far to prove that the race of the reckless caviller with the legitimate business and interests of others is far from being extinct. The only difference, perhaps, that exists between it and the original stock is, it has so far viciously developed that types of the species at the present day concert together and club their "proclivities" in furtherance of the nefarious avocation of gleaning their precarious means of existence by the depreciation of the fairly promoted projects and the fairly obtained property of others.

It would be dignifying with unmerited consideration those attempts to which I refer were I to institute a detailed recapitulation of the laboured statements put forth regarding the Terras Mine and its management. The motive of the writer "and Co." of the epistle on this subject, to which you gave place in your last number, is apparent; and it needed not the prolix puerility of style and utterance so profusely indulged in, to let the world know there are no Terras shares, although they would be very desirable in that quarter. And what, after all, does this pother and prattle come to—a most miserable muddling and meddling—a *vox et preterea nihil*, sounding very like a moan from Bishopsgate-street Within. Where the necessity has been found for such a hanging out of perplexed literature by the yard is a marvel. Why, this tortuous wriggled question is at once met by the plain simple hint that anyone who holding shares in Terras applies at the proper place and time for information will find that the company now working that property is one of the most liberally, and, for the shareholders, most beneficially organised throughout the entire range of mining proprietorship. Nor need it be feared that the "operations of the company" will fail to interest those legitimate enquirers, for, to their best interests have they ever tended, and are now tending even to a great and prosperous issue. But with such the Bishopsgate-street Within writer "and Co." are not edified, as it is not Mining by Act of Parliament! And then, poor Mr. W. S. Pearce, the secretary, what a fix he is placed in, although he "is in the legal profession," by all this forensic fustian of our modern Scribelerus! No doubt that gentleman can answer for himself for having shocked the "limited liability" sensitiveness of his spasmodically equitable censor; and the Direction whose servant he is—itself arraigned by the "busy bee"—will, as doubless, condescend to notice, *lightly as possible*, the buzz without the sting, whereby its moral gravity has been disturbed. To this directorate, however, I, for one with something to lose, am satisfied to confide the interests of the shareholdership. Perhaps it will modify their sense of the *farago* by which they have been pellet-pelted, to be reminded that a certain degree of demonstrativeness at this season is vitally necessary for concerns here and there distributed in London for the benefit of mankind in general, and of mining mankind in particular; finally, that the mud cast at them was no more or less than a mere business advertisement of the place from whence it came. And, as far as the "bogy" factured out of the unhappy Limited Liability Act to frighten them goes, it is as well to know that people have become so crazed by the eccentricities of the dispute which has been so long carried on between Sir Roger Tichborne and the Solicitor-General—a mania for quoting law in a very reckless manner, and indulging in the delusion of being elevated to a seat in the Cabinet as Minister of Mines, under the forthcoming premiership of Mr. Bruce, is very prevalent. Doctor Gull, it is whispered, is the only practitioner who possesses a nostrum for the malady.

Here is another strange episode in mining progress. Its commerce is, at least in London, split into sections so antagonistic to each other, that villification is the rule, its contrary the exception. If information is sought for by an intending investor in this, that, or the other quarter, what is the consequence? He finds in each that the stock and shares dealt in by the others, however good, are almost invariably decried, depreciated, and misrepresented. And this is followed by the disreputable practice of advertising shares at a low price, which are not in the possession of the dealer so quoting them. I will not occupy your space, Sir, by enumerating the flagrant instances of this "dodge" that have come to my knowledge. Of one thing every right-minded person is convinced—that the law, so often invoked, is not equity which does not punitively reach so wilful and unprincipled a perpetration.

"Circulars" evidently so obnoxious to the "frozen out," owe their origin to a spirit of independence aroused by those abuses; and upon a fixed determination not to succumb to them is the circularising system now founded, so far as I am personally concerned. Nor has it failed to serve the general interest, in as much as those publications have introduced *mining* to the knowledge of classes too exclusive to be reached by the ordinary channels. Still more, their influence must eventually be of benefit to all, if the principle upon which I have acted, and to which I am determined to adhere, be adopted. It amounts to this, I do not, and shall never, advocate investment in any mine that does not make returns, and which, according to my conscientious conviction, will not only continue but improve upon them.

And this brings me to East Llangynog, some strictures on which, also published on the 9th inst., beginning like those on Terras with a thrust at the "Speciality" Circular, identify the writers of both, and unite them in a sort of Siamese bond. Suffice it to say that East Llangynog, like Rome, stands where she did, is unmistakeably rich, and, like the Eternal City, has all the machinery of her government at length so complete that she cannot fail in the very proximate future to arise to a mineral eminence rarely equalled; and yet her shares can be had at a little over 3*l.* each—not, mind you, at 5*l.*, as advertised of a now defunct mine, whose boasted returns of 30 tons of ore dwindled into twenty-three hundredweight!

Surely the ghost of "Hammett" (not that in Hamlet) haunts the empty halls of the courts of conscience of her worthy detractors. But in these days there are marvels; a four-footed Daniel has come to judgment, cheered by a congenital *hee-hau* of "H. C." from his Chatham menagerie.

Sir, I have now done with persons, and turn to principles much to be deplored, because detractive at once of fact, truth, and character. I wish, I repeat, not to impugn any man, but those principles I refer to bring to mind the distich—

"Rolling forth scandal in Bœotian brogue,
Each censuring t'other, points himself the rogue."

85, *Gracechurch-street.* J. P. ENDEAN.

TERRAS TIN MINING COMPANY.

SIR,—Allow me to make a few remarks on Messrs. Marlborough and Co.'s strictures on this company, which appeared in the *Mining Journal* of Saturday, Dec. 9.

1.—Marlborough and Co. have a very slight interest in the Terras Mine. I do not, however, on this account insinuate that they are actuated by a desire for personal benefit to bring down the price of the shares. It is more charitable to believe that they are prompted by unselfish regard for the good of those *unfortunates*, as they call them, who have purchased shares on the faith of statements contained in private circulars.

2.—Marlborough and Co. allege a discrepancy between two agreements—the one binding the contractors to erect and place on the mine 200 heads of stamps, and the other only 100. The discrepancy is only apparent. It was at first intended to have only 100, but afterwards it was provided and arranged that there should be 200. Accordingly, the contractor has entered into a distinct contract to do so. Stamping power to the amount of 100 tons per day will be in operation in a few days, and stamping power equivalent to 200 stamp heads will be erected as soon as it is practicable—that is, within three or four months.

3.—Marlborough and Co. it seems have, by diligent enquiry, made the discovery that an agreement, of the 4th of March, 1870, has not been filed at the Registration Court, and assure the shareholders that the penalty of this neglect will fall on them—in other words, that they will be liable for all debts incurred, as though the shares were not fully paid-up. Marlborough and Co. admit that an agreement of that date was duly filed, and I doubt not will be glad to learn that there is, and can be, no debt on the mine till it is properly taken off the hands of the contractor. The contractor duly and legally received from the company the whole 25,000 shares, and for this consideration he is bound to erect or place on it 200 heads of stamps (or their equivalent), and sufficient steam-engines to work the same; also dressing-floors, hauling machines, tramways, buildings, &c., at his sole expense. He is doing so faithfully and beneficially, with all convenient speed. At the end of June last he had expended nearly 10,000*l.* for these purposes, as stated in detail in a circular since addressed to the shareholders. At the present date he has expended upwards of 2000*l.* additional; and he is now engaged in works of various kinds, which will entail on him an expenditure of many thousands more. Indeed, without consideration of cost, he is bound and willing to put the mine in a condition satisfactory to the company, in terms of his contract. On the matter of the capital account there cannot possibly be debt. Neither is there, nor can there be, debt so far as the ordinary accounts of the mine are concerned, so long as the tin sold exceeds the cost of getting it. The ordinary expenses hitherto have been more than covered by the ordinary receipts from the sale of tin; and from the balance of receipts over expenditure the directors, next January, will be quite able to pay a dividend of 5 per cent. on their whole capital. The shareholders, therefore, can afford to smile at Marlborough and Co.'s threat of penalty. And if there be any technical informality in the matter of registration, the directors will immediately attend to its rectification, for they are fully as much interested in all things concerning Terras Mine as Marlborough and Co.

4.—Marlborough and Co. tell us that a pamphlet was issued by the directors, to the effect that "the mine will be worked as an open cutting or quarry, that for many years the workings will be above water level, that the value of the tin standing in one of the elvan courses (estimating only 1 cwt. of black tin to 10 tons of stuff) amounts to 1,130,000*l.*, which far exceeds the richest tin mine discovered in Cornwall, and that the profit was estimated at 50 per cent." These statements of the pamphlet, say Marlborough and Co., have not been realised. "The richest part of the mine is under water. Instead of open cuttings deep operations, involving great additional expense, are recommended, and tin has been sold up to July, 1871, only to the amount of 2136*l.*" Marlborough and Co. are surely most unreasonable. The results intimated in the pamphlet require time for their accomplishment. The elvan, not to speak of another rich tin-bearing elvan running across it, and since discovered, contains all the tin therein described. From the sinking of a winze some 6 fms. deeper than the great adit it has been found that a portion of it, 6 or 7 ft. broad, is worth 50*l.* per cubic fathom. This winze, in the meantime, owing to the wetness of the weather, is under water; but another level is to be driven 10 or 12 fathoms under the great adit, which will effectually drain the elvans, so that their tinstone will be obtained without the use of machinery for many years. It will also so far drain two splendid lodes which have lately been discovered in this part of the mine. In this way the water, which for a few weeks has somewhat hindered the working both of the elvan and the lodes, will be inexpensively and effectually removed. The expense of the deep operations (which are not at the elvan, but at Edwards's and other rich lodes) referred to by Marlborough and Co. is borne not by the company, but by the contractor, who is striving to the utmost to put the mine speedily into a state of perfect and profitable working. And whatever Marlborough and Co. may think of 2136*l.* as the produce of tin sold during the short time since the Terras Company was formed, the shareholders of few mines have had such an experience. When Terras has been fully opened at its various points, and the stamping power completed (and this will happen before summer) the sale of 20,000*l.* worth of tin during the year 1872 is an estimate by no means sanguine in the opinion of those who are best acquainted with its mineral deposits.

5.—Marlborough and Co. still object to the balance-sheet submitted to the general meeting of shareholders in September last. This balance-sheet they affirm was not in accordance with the Limited Liabity Act. On the contrary, I affirm that it was in exact accordance with the Articles of Association of the Terras Company, as authorised by the Limited Liability Act. In these Articles of Association it is agreed in their first paragraph—"That none of the regulations contained in Table A in the Schedule to 'The Companies Act, 1862,' shall apply to the Terras Mining Company (Limited), except so far as they are expressly embodied in their Articles of Association." And in the 103d section it is thus agreed—"That previously to every ordinary meeting of the company the directors shall cause to be prepared a full, accurate, and intelligible balance-sheet and accounts of assets and liabilities for the year ending the 30th of June, and such balance-sheet and accounts shall be placed in the hands of the auditors at least 28 days before the day of meeting; and such balance-sheet and accounts shall be signed by the auditor, and a copy of the balance-sheet and report so prepared shall be produced at such meeting, as also a report by the directors on the state and condition of the company." These articles, it will thus be seen, do *not* require the directors to issue a balance-sheet to the shareholders *previous* to the meeting. The balance-sheet submitted to the meeting of the Terras Company was, therefore, in its form and substance in strict conformity to their requirements. It furnished a statement of the ordinary receipts and expenditure on the mine, indeed of the whole receipts and expenditure so far as these were in the power of the directors. The statement of capital account afterwards submitted to the shareholders was in no sense a balance-sheet. It was simply designed to show the shareholders what the contractor had done to fulfil his contract. Now, it is obvious that neither the directors nor the shareholders have anything to do with that. Whether profitably or not the company gave the contractor the 25,000 shares to develope the mine. The contractor is bound to implement his contract to the satisfaction of the company. And if he does so the company have nothing to do with his expenditure. Yet he is doing so nobly, and from the account of expenditure furnished by him it is evident that the company have ample security that his part of the contract will be fairly implemented by him, without reference to personal advantage.

6.—Marlborough and Co. are grieved at the fact that the management have treated with contempt the Articles of Association, as well as the Limited Liability Act, by increasing the sett and paying the law costs of three new leases without the sanction of an extraordinary general meeting. The shareholders will be glad to learn that all these things were done by the contractor, who, aware of the exceeding value of several fields adjoining the original Terras Mine, by the instruction of the directors, obtained leases of them from the proprietors, and paid the expenses out of his own funds; for the item of 132*l.* 18*s.* for the three new leases was paid not by the company but by the contractor. And it may be mentioned here that so great is his interest in the Terras property, and so great are the benefits he has conferred on it, that at the same time he secured an extension of the lease for more than a year, and a reduction of the dues from one-fifteenth to an eighteenth part of the produce.

7.—Marborough and Co. revert a second time to the balance-sheet presented to the meeting in September last, and ask whether it was in accordance with the Articles of Association. I answer as before—everything required by those articles was carefully attended to in that balance-sheet. There has been no revised statement of the company's accounts, and, therefore, there cannot be any discrepancy between them. The balance-sheet laid before the meeting answers for itself, and is the only balance-sheet of the ordinary accounts of the company—the only accounts with which the company have to do. The accounts afterwards sent to the shareholders referred to a different matter altogether—the extent to which in the limited time the contractor had fulfilled his contract and the security possessed by the company that he will fulfil it to their satisfaction. The requirements of the Acts and the Articles of Association having thus been complied with in their letter and spirit, the general meeting in September was altogether legal, and there is no necessity for holding another till the business of the company requires it.

8.—I have pleasure in assuring Marlborough and Co., as well as all the shareholders, that Terras Mine is in a most prosperous condition. The lodes are numerous, and many of them very valuable; the elvans are increasing in quantity of tin, and after a few weeks, when the cross-cut at the engine-shaft has been driven to Edwards's, Rickard's, and other lodes; when a lower level at the bottom of the great elvan and other arrangements have been made for draining the water from the elvan and from the newly-discovered lodes, which are already producing splendid tinstuff; when the elvans have been further opened up, and the 200 stamping power has been erected, all which are on the eve of being speedily finished, the friends of Terras will have more than reason to be satisfied. The value of a mine is not to be tested by praise or censure, but by results, and these in the case of Terras are certain to exceed all expectation. As a late shareholder, who acquired my shares at a premium, and who for my own interest have examined most narrowly into everything connected with the mine, I am more than pleased. I have never sold a share, I am still purchasing, and I purpose to hold my shares as an investment. Capt. Rickard is a skilful, active, and upright officer; the contractor is a man of sterling worth, ability, and perseverance. The mine is teeming with mineral wealth; the works needed for opening it are far advanced, and are proceeding with all the spirit and speed that can be desired. In a word, *Terras is a prize*, and my counsel to all shareholders is to hold on and increase their interest in it. It will soon be beyond the reach of misrepresentation and detraction.

Dec. 13. A NEW DIRECTOR.

MINING IN MONTGOMERYSHIRE.

SIR,—For the last fortnight I have spent a few days in this county, both north and south, and I find that all the land throughout has been taken possession of by different parties for mining, and although no mine of any great consequence has as yet been discovered all hope to possess riches even equal to their neighbour, the Van Mine. There are some who are already beginning to give up in despair, because they have not met with success in the beginning of their working. We all know the years it took to find the wealth of the Van, and yet when found it was seen that months could have discovered it to the eyes that sought after it a number of years; therefore, timid speculators, do not give up too soon—try a little longer, and a little deeper. There are many mines surrounding the little town of Llanidloes, many of which are lying idle. Why? Because the different companies must be afraid or too chicken-hearted to go on; at the same time, none of their mines are scarcely as deep as the Van—go deeper, then, I say. Many of the mines I have seen—in fact, most all of them—and as I have told the different agents, and am not afraid to tell the mining world, that such and such mines should not stand idle in such a mining district as Montgomeryshire, as some of the richest mines mentioned in the Journal may be found in this county, and will be for generations to come.

Adjoining the Van Mine is the East Van, on the same lode as the former. Here they are expecting shortly to surpass the rich Van itself. Again, to the north of these mines lies the North Van, Neiadd-Llwyd Mines, &c. The lodes already discovered on the lands spoken of are really promising, and deserve greater attention than I am able at this time to give.

I would then begin at the village of Llanbryn Mair. The nearest mine is the Ithyd-y-Mwnn, where a lode of rich ore, about 3 ft. wide, was discovered a short time since; and about a mile north-west of this mine is one known by the name of Cwm Bychan—a sett about a mile long upon the course of the already discovered lodes, and nearly the same width. Shafts and levels have been sunk and driven but very little, although some beautiful lumps of lead are on the floors now, and tons have been sent off to the market from time to time, yet all had been done by the miners themselves. This property is now for sale very cheap. Again, to the south of this and adjoining sett is one now being worked by Capts. Evens, Owens, and other parties—in fact, all the way south of these mines, even through the Rhew-Edwant, and away through and over the hills near at hand, enclosed in the different mining setts or Rhoswydol, Cwm, the Dyliffe, and other mines, home to the Van district, adjoining the Llanwr-y-Glyn, North Van district. I hope, therefore, any parties who are interested in mining throughout the county may not get weary too soon, but strike on, and success in many parts I have mentioned is, in my opinion, certain. With a spirited leader, good management, and a liberal capital (not large) nothing can or should be considered too hazardous or too difficult to attain and obtain.

My report next week will be upon some of the mines in Cardiganshire rich district.—*Aberystwith, Dec.* 19. SAMPSON TREVETHAN, Mining and Consulting Engineer.

OLD LLANGYNOG AND WEST LLANGYNOG MINES.

SIR,—Being a shareholder in different mines in Cornwall and Wales, I feel much interested in mining, of course. I am pleased to see such good reports in respect to the above old mine, and having been persuaded lately to take shares in the West Llangynog, and seeing such flourishing reports published in the Journal as to the prospects of this mine, and that of the Old Llangynog lode passing through the sett, and that the boundary of each mine being almost close to a course of lead ore 3 ft. wide in the old mine, this induced me to make enquiries if these statements are truths or not. And, for the benefit of all interested in mining, I will give them the result of my enquiries.

First.—I find there is but little doubt that the main lode passes through the West Llangynog sett; unless some freak of Nature such as a cross-course occurs, that might throw the lode off its right direction.

Second.—The statements made that the boundary is within 250 fms. of the Old Llangynog is an exaggeration. My information, which I believe to be strictly correct, is that the distance is 440 fathoms, or near one-third of a mile, and there are two freehold estates between the mines, which constitute a large sett. And I am further informed that the present agent of the Old Llangynog holds a grant of those two estates. "Devoniensis," in his remarks in the Supplement of the *Mining Journal*, draws a line between West Llangynog and East Llangynog. Certainly they are far from each other in comparison. East Llangynog is a mine open with some good bunches of lead, whereas the West Llangynog is quite in its infancy, with the lodes to discover, and the chances of finding them productive afterwards. It appears to me that "Devoniensis" is interested in the infant mine, or he cannot know much about the mines in this district. May I ask, what improvements can have taken place in the young mine when there is no lode intersected in the cross-cut, which is the only place working? Parties more interested should be able to explain matters here mentioned.—*Oswestry.* OBSERVER.

[For remainder of Original Correspondence see to-day's Journal.]

LEVANT MINE, SAINT JUST.

The first meeting of the new company of shareholders was held at Penzance on Monday. The following were present:—Messrs T. S. Bolitho; Edmund Davy; R. R. Michell; E. H. Rodd; W. Harvey (Hayle); J. B. Coulson; N. B. Downing; J. J. A. Boase; H. C. York; R. Boyns (banker, St. Just); T. T. Pool; C. Read; W. Holman; P. Olds; R. Wellington; R. B. Searle; G. Eustace, jun.; R. Quick (Trewellard); W. Tresize (Trewellard); R. White (Bojewan); Capt. N. Pentreath; R. Thomas (St. Just); R. Bosence; and Capt. Thomas.

Mr. Edmund Davy was elected chairman on the occasion. It was moved by Mr. T. S. Bolitho, seconded by Mr. R. R. Michell, and carried unanimously, that in order to provide for the purchase of the plant, materials, engines, &c., on the mine, and also for the carrying out of the necessary operations in re-working the mine for the present, a call be made of 3*l.* per share (the present estimated number of shares being 2000).

The estimated value of the plant and all materials is somewhere about 3000*l.*, so that by the call now made there will be the sum of 3000*l.* left available to work the mines. There seemed to be a general impression at the meeting that this sum will go greatly towards getting all the workings of the mine in order.

It was resolved that a banking account, on behalf of the mine, be opened at the Mount's Bay Bank. It was also resolved that advertisements be at once issued for a managing agent, who shall be elected by the managing committee, at a meeting of them, (and also any adventurers who choose to attend), to be held at St. John's Hall, on Dec. 28.

The following shareholders were choosen as a committee of management:—Messrs. E. Davy, R. R. Michell, J. B. Coulson, R. Boyns (Boswedden), and R. Boyns (Bank, St. Just). Mr Richard White was elected secretary.

It was stated by the Chairman that the lords grant new setts on exactly the same limits as those held by the former company, for a term of 21 years. The lords also agree to suspend the payment of all dues until the mine pays its costs. The leases of the old company expired on Dec. 2 last.

It was unanimously agreed that the managing committee take off and pay for the entire plant and machinery from the old company at once, upon the terms agreed upon by the arbitrators. A large number of additional shares were taken up at the meeting.—*Cornish Telegraph.*

THE FIVE-WEEK MONTH.—At two most important mines—Carn Brea and Tincroft—the manager announced the glad news to the assembled hundreds on Saturday that from henceforth the five-week month would be done away with, the pay-day for the future being at the end of every fourth week—meaning that the struggle for subsistence for the fifth week, four times in the year, with the same amount of cash as four weeks, would not occur again; and only those who have experienced the trial can fully appreciate the boon.

PRODUCTION OF ALKALIES AND THEIR SALTS.—Mr. C. Crockford, of Holywell, takes such metallic oxides as are soluble in the caustic alkalies (such oxides being either natural or artificially produced), dissolves them in a solution of caustic alkali, and then adds to the solution the sulphide of the metallic base of the alkali in which they are dissolved, whereby the said sulphide is converted into caustic alkali, and the metals are precipitated as sulphides. When it is desired to convert the caustic alkali into a carbonate, the inventor utilizes the carbonic oxide generated in the process of converting an alkaline sulphate into the sulphide of its metallic base by heating it with charcoal or coke; this carbonic oxide is then converted into carbonic acid gas by burning it, and the carbonic acid gas is then conducted into a solution of or over or through the dry caustic alkali to be converted into the carbonate.

EXCAVATING ROCKS.—The object of the invention of Messrs. SHELLEY and BULLOCK, of Pottsville, Pennsylvania, is to save labour and expense in removing material. They first bore all the drill-holes, then fill them with suitable materals, and lastly shatter the rock in successive lifts by repeated explosions until it is torn away to the bottom of the drill-holes.

Royal School of Mines, Jermyn Street.

[FROM NOTES BY OUR OWN REPORTER.]

LECTURE VIII.—Having endeavoured (continued Mr. SMYTH) in my last lecture to place before you some of the principal points of interest connected with lodes, and how in certain districts it has been attempted by Mr. Carne and others to group the lodes by their direction, and by the metals found in them, I may mention that there had been many attempts to do this before. You will find from Dr. Pryce's "Mineralogia" that some excellent attempts were made in his time, but only by working miners, who adopted the principle of classifying the lodes by the metals found in them. Those attempts, however, have not stood the test of experience, and that because if lodes are followed from one place to another they have been found to exhibit very different characters. It is, however, especially in reference to another point that these predications become valuable—that which happens at or from intersections when lodes come together. These phenomena may be divided into two classes; first, those produced by planes of division in the rocks which have the same strike or course, but which are intercepted as they pass downwards in depth; and, secondly, those intersected by horizontal planes having a different course. Of those intersected vertically a great many examples will be found in the same district, while other districts are free from them; and thus miners who are not cognisant of these facts often find themselves in difficulties. The sudden manner in which all the workings are brought to a standstill by the lode being cut off altogether, or in other cases until the remainder of it be found in one direction or another, is often most perplexing and discouraging. Various suggestions have been put forward as to the cause of these sudden interruptions, and what method is best for finding that portion of the lode which in this way has been lost. The subject is better understood now-a-days than formerly, and it must have been a great difficulty to the old miners, and in the older books there are many references to it, but in none of them is it explained either as to what had been done by nature, or what should be done by the miner. Reussler, Von Oppell, and Werner all wrote on this subject; but until Werner dealt with the theories of mineral veins in the spirit of a philosopher, as well as with the practical knowledge of a miner, it was scarcely even guessed that these changes result from great movements. Werner's "Theory of Mineral Veins" is a work even now of a valuable character. It was after this time that two or three German authors of excellence produced important works on the same subject, and particularly Schmidt and Zimmerman, the latter adopting the views of the former (viz., that wherever there has been a vertical movement there has also been a horizontal one), and carrying them further. There is a great deal of information on this subject in a paper by Mr. W. J. Henwood, of Penzance, in the 5th volume of the Transactions of the Geological Society of Cornwall, more particularly with reference to these phenomena in Cornwall and Devon, where upthrows and downthrows, as they are called, are well understood. In the St. Agnes district, where heaves are frequent, it has been found that in 49 cases out of 50 they have an unfailing rule by which to recover the lode.

If we turn to the pages of Mr. Henwood, whose name I have already mentioned, we shall find that he examined a great number of these intersections, and tabulated the results. Out of 733 intersections of lodes by cross-veins he found 22·7 per cent. intersected but not heaved; that those heaved in the direction of the right hand were 51·1 per cent., and those heaved to the left hand 26·2 per cent. Again, he found the heaves by the side of the larger angle were 62·5, while those to the side of the smaller angle only 12·9. It is not surprising that practical miners, having observed the preponderance of heaves to the right and to the side of the larger angle, should always be inclined to follow that side when a vein is lost. Mr. Smyth then explained various ways in which this was done, and which may be thus summarised:—

When the two lodes dip contrariwise we must follow the side of the acute angle. When they dip within the right angle, then much depends on the depth of the dip, and we must follow the obtuse angle. When the dislocation has a less angular dip, then we must adopt special rules, which are only to be worked out according to each particular case. And the mode of working it out is a very simple one. When a lode is lost by the dislocation produced by a cross-course, lay down on a horizontal plane the course and direction of underlie of both the lode and cross-course, when there will be observable a smaller and a larger angle at the point of intersection, except in those rare cases where the one happens to be exactly at right angles to the other.

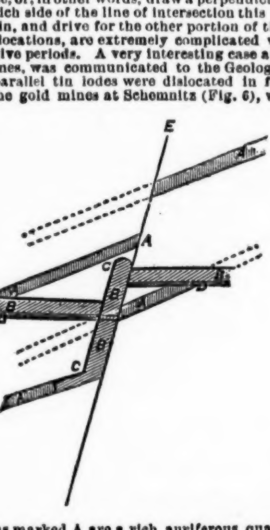
1.—Then, if the two veins (lode and cross-course) dip contrariwise—that is, if there is more than a right angle between their lines of dip as taken in *plan*—drive along the slide *on the side of the acute angle*.

2.—If they dip *together*, or within a right angle, when the dip of the lode is flatter than that of the cross-course, drive *on the side of the acute angle*.

3.—If the cross-course is flatter than the lode, adopt the following general rule, depending on the deviation of the dip of the former from the line of intersection of the two veins:—

General Rule.—At the point where the cross-course is touched determine and lay down horizontally the line of intersection of the two planes (lode and cross-course). Then from the same point project horizontally before you the line of dip of the cross-course, or, in other words, draw a perpendicular to it in front of you. Remark on which side of the line of intersection this perpendicular falls, and on that side cut in, and drive for the other portion of the lode.

These slides, or dislocations, are extremely complicated when they occur in veins of two successive periods. A very interesting case at the Polberro Mine, situated near St. Agnes, was communicated to the Geological Society, by Mr. Pyke, in which two parallel tin lodes were dislocated in four different ways. Another case from the gold mines at Schemnitz (Fig. 6), was very difficult to



deal with. The veins marked A are a rich auriferous quartz; and they were first split across by a vein B, of another character, where the dots are being where the veins probably would first run, nothing now exists. A second dislocation took place at C, bringing in another metalliferous lode, D, as well as the worthless vein, B; and after that the cross-slide, E, produced a third dislocation. The lodes being cut up in this way became for a long time quite a puzzle, because in nature and amidst hard rocks very little is to be seen at a time, and it was only by driving cross-cuts, and much research, that the case was made out. A lode in the South Towan Mine in Cornwall, was suddenly brought to an end by a fault, and after much search was given up as lost. It happened, however, that a tributer, one of a class of miners who have very sharp eyes for such appearances, detected 25 fms. off in the slide a bit of metal, which led to a renewed search, and the lode was recovered at a distance of not less than from 30 to 40 fms. It is seldom, however, that heaves are of such great magnitude. Mr. Henwood in the large number of dislocations which he examined (see ante) found that the mean distance of their heaves was 16·4 feet.

The lecturer gave a great number of illustrations on the board of slides and throws or heaves.

LECTURE IX.—Having (said Mr. SMYTH) set before you some of the difficulties with which miners find themselves beset, and especially in some districts, as to the continuity of the deposits, it will no doubt occur to you that, considering the complication which often arises when veins are interrupted by one set of cross-courses, dislocated by another, and then perhaps mixed up with a third coming in from a different direction, the mine manager ought to be able to bring to his assistance all the information accumulated by experience. That is the more necessary as there are not a great number of books to be cited in which the particulars of cases have been brought together with the care the subject deserves. There are two or three which give a great amount of detail, but they must be supplemented by actual observation. It is true with respect to most dislocations the difficulties may be overcome by a careful examination of the circumstances, and a good geological and geographical knowledge of the district, together with correct ideas as to the mechanical movements to which the strata have been subjected. For instance, it is a known fact that by the great cross-course of Cornwall the whole of the lodes are shifted, so much that it is evident that there has been a great amount of lateral as well as alternate movement. In looking, therefore, for a lost vein the circumstances brought about by that cross-course will have each its due weight. And, again, if we are in a district like that of Freiberg, where the veins are so numerous, we must expect that the phenomena will put on a different aspect to the districts where they have but one or two.

We will now consider another set of deposits, which neither agree with the beds or strata nor the regular lodes, and which are called "irregular deposits" of minerals. Of these there are a very great variety, and some are found to approximate very closely to true strata, although different in some material particulars. Others are more like lodes, but with a dangerous kind of resemblance, leading to their being mistaken for lodes. I may point out that in a mine in Flintshire, which is now being worked (and I trust it will have success) in rocks of millstone grit and sandstone, there are beds of limestone and shale noted for their east and west lodes of excellent lead ore. Some years ago a promising shodestone was picked up, and where it was found a number of trial shafts were put down, and cross-cuts made to find the vein, and to the surprise of everybody a bed of galena, 2 or 3 ft. in thickness, of wonderful richness, was discovered. This galena is in a form equally distinct from a bed or a lode, and it would be totally erroneous to calculate on its being a stratified deposit. As a proof, however, that the beds of limestone and sandstone have not had interposed between them a true bed of galena, it was found on following it up rather carefully that it went down in a V shape, and that it must have been washed in between the two. The contact of limestone and sandstone is particularly favourable to the occurrence of irregular deposits of one kind or another. If we take a general view of these irregular deposits they may be grouped under four heads:—

1.—Those which follow more or less the contact of two rocks.

2.—Those closely connected with crystalline or igneous rocks, as, for example, gneiss, greenstone, and varous other quartzose materials.

3.—Those associated with metamorphic rocks.

4.—Those more especially associated with limestone.

In the first group we see that there is a close connection between the deposit and the rock which contains it. This is notably the case in Scandinavia, where a small number occur in regular lodes, but mostly in these irregular repositories. The characteristic of a regular lode is that of passing from one bed to another, and bearing ore indiscriminately in either, whereas these seldom go beyond their enclosing sides. In order to distinguish irregular deposits which lie between stratified beds from lodes they are called by a variety of names. Thus, in France they are termed "amas," in Germany "lager," and, according as they are vertical or horizontal, "strahende" or "liegende."—2. The second group are those deposits which are found in the crystalline rocks, and of which we have few good examples in this country. They attract great attention, however, on the Pacific side of America, where it is difficult to discriminate between them and true lodes.—3. In various parts of Germany important irregular deposits are found associated with the metamorphic rocks. In the south-east part of Hungary there is a remarkable case to be found. In a district called the Banat, 70 or 80 miles in length, where one of the valleys is called the "Iron-gate," there is a great syenite dyke, which passes from the Austrian side of the Danube down into Servia, producing the beautiful and interesting irregular deposits found in the mines of Moldawa, Szaszka, and Oravitza, where the limestone is changed into granular marble, with garnets and wolframite, and where a great many valuable ores are obtained, such as gold, silver, copper, zinc, lead, and iron. These metals are not only at the point of contact, but between the rocks, in which a great number of minute metallic veins run in all directions, interlacing each other. These deposits are worked in a peculiar manner, called stockwerke, from the German stock, a story, because the excavations are one over another, like the stories of a house. The best examples of this sort of work is where the district leaves the mountains which separate Bohemia from Saxony, where there are several elevations of granite, coated with other material, and where this central granite is filled with a number of veins crossing each other, so that the entire mass may be worked for the tin dissemminated through it. The mines of Geyer, Altenberg, and Erzgeberge, in Saxony, and of Schlaggenwald and Zechstein, in Bohemia, are remarkable for this process. Another sort of rock, locally called grieson, which is associated with granite and mica, and removed by stockwerke, produces caverns of extraordinary dimensions, particularly at Schlaggenwald. The process is as follows:—The orey material being removed from a chamber of considerable dimensions, another is opened beside it, and so across the whole deposit. Then another row of open spaces is made above; but sometimes the walls, or floors, of separation are left too weak, and a fall takes place, which brings down other walls, and a grand catastrophe is the result. This is one of the most remarkable mining districts in Europe. The mines have been worked probably in a similar manner since the days of Trajan, particularly those in the neighbourhood of Vöröspatak, in the district of Abrudbanya, the appearance of which is now that of a number of old furnaces, and to which the name of Cstatze has been given. There are some curious repositories of this kind in two or three districts of Spain, where they are called carbonas. Amongst the remarkable irregular deposits in this country there are some in the district of St. Ives, from whence, at the Providence and Consolidated Mines, extraordinary quantities of tin ore have been raised. They do not go down like a vein, although they are often larger than the lodes themselves, and seem to have no continuation beyond their own mass, except a few small strings or branches.

Amongst the repositories of ore which occur partly in the stratified and partly in the metamorphic rocks, one of the most curious in Europe is in Tuscany, where rich ores of copper are largely obtained in connection with the serpentine of that district, a somewhat peculiar rock (of which a specimen was on the table). It is, however, a tertiary district, where we should naturally expect nothing of the sort. There is a mountain there called the Monte Catini, where 40 years ago it was observed that the ancients in the middle ages had made various mining explorations at a spot where the rock was a sort of conglomerate or soft serpentine. This was only about 1 foot or 18 inches in width at the surface, but although some specks of copper were obtained from it no explorations were then made on a large scale. In 1830 it was taken up again, on account of the enthusiasm of a Frenchman, who, however, making no discovery, passed it over to a party of English adventurers who happened to be out there. Under the guidance of a German head miner, who had introduced the adventure to them as one likely to do well, they commenced working; and from 1837 to the present time it has proved for a small mine one of the richest in Europe. The principal features of the case are somewhat unusual. A sort of tongue of soft serpentine, surrounded by a shaly sedimentary rock, called "gabbro-rossa," which appears to have been affected by some mechanical force, as it is full of convolutions and contortions, and to have been subjected to a great deal of chemical action. In some places it is distinctly stratified, and in others it appears to have been ejected into the serpentine. Where the gabbro-rossa meets the serpentine there occurs the rich ores for which the mines are famous—bornite, copper glance, and sulphite of copper, without the slightest trace of impurity. Below is a hard, dense sort of serpentine, of a character very different to the other, and which bears no ore. Driving through the mass of serpentine little lumps of copper ore are seen, very irregularly scattered, sometimes only the size of a nut, while some lumps are masses of 2 or 3 tons of pure ore, without any crystals of quartz or felspar, what we should expect to find. It is worked at a depth of from 50 fms. to 140 fathoms, but it cannot be expected to set down like a regular lode. Nothing can be more dangerous in mines of this sort than to trust that one section will give a fair view of what it is likely to be to any considerable depth. The great value of this particular mine is enhanced by the easiness with which the material is worked, and because the richness and the splendour of the ore renders dressing for the smelter unnecessary. Deposits of this kind are by no means unusual in serpentine rocks passing into the metamorphic, one of the most notable instances being that very ancient set of mines called the Rammelsberg, in the Hartz, where an irregular deposit is situated on a hill side, the rocks being of clay-slate, and extended over a length of 180 ft., and descending in depth to 350 ft., through quartz, hornstone, zinc-blende, and iron and copper pyrites, and producing no fewer than 15 different metals.

4.—The group of irregular deposits connected with limestones though last is not the least in importance. It is said that it is only limestones of a certain geological age that are the bearers of metallic ores, but we shall find on examination that it is not geological age on which the presence of minerals can be expected to hang. It has been asserted, and was long believed, that gold was confined to one class of rocks of a certain geological age, but now the matter has been looked into we find that it depends upon the chemical and physical condition of the rocks whether or not we meet with certain minerals associated with them. In some cases the newer rocks have been subjected to action of such a kind as may have made them eminently productive of ores. Take, for instance, mountain or carboniferous limestones, and also the Silurian and Devonian limestones; and we have the important deposits of iron ores in the North of England, the Forest of Dean, and part of Wales. In the Forest of Dean they cut through the sandstone, and then came to the limestone standing on edge, and passing through 30 ft. of this came on what the miners call "the lid," because it is known that generally under that will be found granular iron ore. As they are not dealing with beds they cannot be sure of meeting with leads of ore, but it is, however, mostly the case, and then after a few more feet the limestone comes in again. On the opposite side of this district the strata lie at a gentle angle of inclination, and the shafts go down till they come to "the lid," that crystallised granite rock which the miners recognise at once, and then to the valuable brown iron ores of the district, which sometimes are found occupying a considerable height and breadth, called "churns," one of which is sometimes capable of turning out from 20,000 to 80,000 tons, and which generally wedges out to nothing. If we turn to the North of England we have those extraordinary deposits of true hematite ore which make the two localities of Alston Moor and Cleator Moor so remarkable, and where the deposits are so irregular that it is impossible to lay down any regular system of working. As in the Forest of Dean so in the North of England "churns" are also largely present. Taking a transverse section, you may pass from nothing to "churns" of 150 ft. of solid iron ore, and reckon their produce by hundreds of thousands of tons per annum. Another curious sort of deposit are those called "flats," in the Alston Moor district, in which the ore is thrown out in a horizontal position, having the appearance of stratification. In the lead mines of Yorkshire, above Richmond, there are small deposits, called pipe-veins, or locally "flats," which are notably rich, producing ores of extremely high quality and massive character. They run in long pipes, almost like drains made by nature. I happened on one occasion to be there, and saw the men pull out several cwts. of the richest galena, coated over with a white substance. The matrix was partly filled with "wamp," a sort of dolomitic sand, amongst which the galena lay like flitches of bacon. In depositories of this kind the connection of limestone with carboniferous shales contain lead ores, and the oxides of iron which are so notable in the Belgian coal field at Liege and Aix-la-Chapelle, and which gave rise to the famous Vieille Montagne Company's mines, the centre of all the zincworks of Europe, a trade which that company took up on so large a scale as enabled them to almost monopolise the zinc trade of the world for many years; and the same company has since acquired mines in other parts of the world, including some in Spain, on the shores of the Bay of Biscay. There are there a series of limestone formations, which produce calamine in large quantities, in workings which Mr. O'Reilly and Dr. Sullivan have so well described in detail, but of which it is enough now to say that those gentlemen have obtained plain evidence of a great outrush of material, and the injection in some way of these valuable materials. [The lecturer concluded by exhibiting specimens, on which the action of water was plainly visible.]

CUTTING COAL AND OTHER MINERALS.—The improvements in machinery or apparatus for cutting coal, stone, and other minerals, invented by Messrs. ROTHERY, of Waterloo Main Colliery, Leeds, relate partly to the form and arrangement of the cutters employed in the machinery for cutting coal, stone, and other minerals, and also to an improved construction of tramway for colliery purposes generally. The object of the first part of this invention is the cutting of a much narrower groove than has heretofore been found, practicable by continuous revolving or rotatory cutters, whereby the power required is considerably reduced, and less waste of the coal or other mineral is effected; facility is also afforded by means of the invention for cutting a groove to any desired depth without reference to the size or diameter of the rotatory cutter employed. The arrangement of tramway affords great facility for taking up and re-laying the rails as the work progresses, it being simply requisite to knock out the wedges from the tail pieces of the hinged jaws, when the bars or rails will be at once released.

STAMPING SHEET METAL.—The invention of Mr. ELISHA DYER, of Rhode Island, U.S., consists in the novel arrangement of a series of male and female dies, and in combining therewith certain novel feeding mechanism in a machine to accomplish the complete forming of a perfect eyelet or other similar article from a strip of sheet metal, and remove it therefrom without any necessity for an intermediate annealing of the metal during the process. Four dies are arranged upon the main shaft so as to produce a vertical reciprocating movement all at the same speed and at the same time. The first is the preliminary forming die, which first operates upon the metallic strip, making an imperfect cup or blank, with its upper edge slightly flaring. The second is the die which completes the cup-form and the upper flaring edge, the drawing or swaging being divided between them. The third is a cutting-die arranged to cut away the bottom of the cup. The fourth is the clearing or cutting die which removes the finished eyelet from the strip. The cutting edges of the die operate just outside of the upper flaring edge of the eyelet, which, thus finished, is forced through the female die and delivered below. He combines the four dies with feed carriage and clearing lifters. The dies and feeding devices are arranged in combination with a cam, a spring lever, a feed bar, and adjustable dogs. In combination with the third die for removing the bottom of the blank, the feed carriage is fitted to slide upon the face of the female die, provided with a longitudinal groove, and arranged so as to deliver the blanks in the strip of metal to the cutting die in a vertical position. He cuts away portions of the metal from the edges of the ribbon or strip at regular intervals corresponding to the length of stock required for each eyelet or other similar article, thus forming a strip of partly formed planchets or blanks.

ASBESTOS, AND ITS APPLICATION.

In a paper read before the Institution of Engineers and Shipbuilders in Scotland by Mr. ST. JOHN VINCENT DAY, C.E., F.R.S.E., he stated that the employment of asbestos as a packing for the stuffing-boxes of piston-rods, valve-rods, and the pump-plungers of steam-engines would result in considerable economy in one item of working expenses. The chief object of the paper appears to have been to supply information relating to the nature and extent of asbestos deposits, more especially in the northern portion of the American continent, and his information appears to be of the greatest possible value. Asbestos is constituted of silicate of magnesia, silicate of lime, and the protoxide of iron and manganese, the silica being sometimes replaced by alumina. It is chiefly found in the serpentines of Piedmont, Savoy, Salzburg, the Tyrol, Dauphiné, Hungary, Silesia, Corsica, Greenland, and the United States. It also occurs n various parts of Great Britain and Ireland, but by far the most extensive deposits at present known exist in the United States, Italy, and Corsica.

In almost every one of the United States asbestos is met with in the drift in detached masses, varying in size from a few inches to several feet; it is also found *in situ*. The entire Alleghanian and Appalachian chains of mountains appear to be faced in their eastern slopes with asbestiform rocks, and in some portions of these the asbestos veins occur in thicknesses varying from 0·125 inch to several feet. A remarkable characteristic of asbestos deposits is that the fibre never lies parallel with the longitudinal axis of the vein, but directly at right angles to it, and sometime obliquely to that axis. The matrix is invariably serpentine, so that when the mineral is found *in situ* there is always a belt of that rock on either side of the vein. In the appearances or colour of the mineral there are wide differences, but its properties are constant in quality though varying in degree. In Carolina, Virginia, and Maryland the mineral occurs in massive form. Indeed in these localities the veins are so compact that immense blocks of it can be blasted out or wedged off, as in ordinary quarrying operations, but it is usually much mixed with impurities. The fibre is of a yellowish white tinge, and in some cases of a bright orange colour, of little tenacity, and easily triturated. The action of water on the fibre of this species of asbestos is to cause it to assume a soft pulpy condition; still it has the constant qualities of refractoriness and resistance to the action of acids. The fibre in these formations is sometimes 3 ft. in length, though more usually about 10 in. Passing northward, and through the States of Pennsylvania and New York, the asbestos deposits are irregular, the continuity of the mountain ranges being broken up, and the trend constantly varying. The character of the fibre, too, appears to undergo a change, becoming shorter and more of a grey colour, with a decrease of magnesia and an increase of silica. The tenacity of the fibre is greater, but the formation is less compact.

Beyond Central Vermont, on the eastern slope of the Green Mountains range, and in New York State, on the eastern slope of the Anderondacks, there occur some of the most remarkable and extensive formations of asbestos and amianthus at present discovered. The veins here are very distinct, invariably lying north-east and south-west, with a dip of about 40°. The fibre is of extreme fineness, and high tensile strength. An examination of the several varieties of asbestos appears to indicate a gradual increase in the tenacity of the fibre found in a direction proceeding from Georgia to Vermont, and this quality appears to culminate in that found in Northern Vermont. The fibre in this locality varies in length from 2 in. to 40 in., and in colour, when taken near the surface, resembles that of unbleached flax; but as the veins, which occur in belts about 20 in. apart, are worked into from the surface it becomes a pure white, endowed with great flexibility and tenacity. The Canadian asbestos appears to be even more valuable than any of the other; the fibre is short, but is endowed with a higher tenacity than that of any of the other deposits of asbestos previously alluded to, and when the fibres are crushed asunder they are pure white, and of a downy softness to the touch, capable of being spun into yarn for weaving, or for being pulped to make paper. In the St. Francis River, near Richmond, in Canada, the asbestos found is of a glistening satin white in appearance, but, containing an excess of magnesia, its tenacity is very low, and the fibre ranges in length from 2 in. to 2 ft. The belt of asbestos is here over a mile in length, about 120 ft. wide, and of unknown depth. It is estimated that at least 100 tons per day could be taken from it for 50 years.

With regard to the application of asbestos, it is well known that both in ancient and modern times cloth closely resembling linen, and fully equal to it in strength and regularity of texture, has been produced, and Mr. Day remarks that sufficient experiments have demonstrated that paper of superior quality can be made of it. Its especial value, however, appears to be as packing material. The packing used for pistons and valve-rods or spindles has three prime elements of destruction to contend with—an elevated temperature, friction, and moisture; one only of which—friction—has any appreciable effect on asbestos packing when the mineral is pure, and properly prepared. On the Caledonian and North British Railways, with asbestos packing in the cylinder stuffing-box, an engine was run 14,070 miles, when the greater portion of it was found to be still uninjured. Round the piston-rods of the steamship Anglia it had been in use while the vessel run 24,000 miles, or four round voyages between Glasgow and New York. The packing was still good, the speed of the piston was 340 ft. per minute, and the pressure of steam 37 lbs. per square inch. The rod did not heat, and the gland was only screwed up at the end of each voyage. As a company is in course of formation for manufacturing the packing, further particulars will no doubt be forthcoming shortly.

NOTE ON THE MINING DISTRICT OF SARAWAK.

By Capt. JOHN LANYON, formerly of Breage.

The territory of Sarawak is situated on the eastern coast of the Island of Borneo. It formerly belonged to the Sultan of Borneo, and was handed over by him to the late Sir James Brooke, in payment for the assistence rendered by him to the Sultan in suppressing various insurrections in this and other parts of the Island. Sarawak is nothing but a jungle from one end to the other, and just the same might be said of the whole Island of Borneo. Some of the trees are very large and high, and there is a great variety of them. It is also a mountainous country, some of the mountains being 13,000 feet high, and from 10 to 15 miles long. The rocks here (Zegora) are clay-slate; but 12 miles further north there is a large mountain of a beautiful granite, and a little to the east are mountains of limestones, varying in height from 500 to 1200 feet. One of these mountains, called Start, is 1200 feet high, and quite perpendicular on one side for the whole height. In these limestone mountains there are large caves, running through them for great distances. In some of these caves gold has been found, intermixed with the sand that has been washed in from time to time. It is thought that with machinery to pump out the water large fortunes might be obtained here.

The general produce of the country is rice, sago, gutta percha, india rubber, sugar, bees' wax, rottans, and minerals. The Borneo Company has a right for working all minerals that may be found, gold excepted; they are at present working two minerals here—sulphide of antimony and cinnabar. The antimony works are carried on at a place called Jambusan, on the River Sarawak, about 40 miles from from the mouth. The sulphide of antimony is almost invariably found near the junction of the limestone rock with the porphyry. The ore is mostly found as boulders embedded in the clay, in the large valleys between the limestone mountains; lodes of ore, running into the limestone, are also worked on, and give good profits; the boulders of ore found in the valleys are, no doubt, the

result of the decomposition of the limestone mountains, or ridges, which formerly contained veins or ore. The Borneo Company has erected several smelting furnaces here, for the conversion of the ore into a purer sulphide.

The cinnabar mines are situate about 12 miles from the antimony works. The formation of the mountain in which the cinnabar is found is basaltic, which has been forced up through the sandstone. The mountain is about 800 ft. high; at the top there are two large peaks of solid rock, quite exposed, and standing nearly perpendicular on one side for a height of 150 ft. (these two large peaks contain the cinnabar). This exposed mass of rocks has been breaking up for ages, and large boulders have become detached, and rolled down the side of the mountain in all directions: these boulders have more or less decomposed, and the cinnabar which they contained has deposited itself on the soil. Most of the soil on the western side of the mountain has been washed, and large quantities of almost pure cinnabar have been obtained in this way. Large quantities of ore are also got by exploring the mountain.

We have at present an engine and 16 heads of stamps for pulverising the ore, also a good washing-floor for dressing it. The ore, after dressing, is smelted on the spot, in cast-iron retorts, and most of the quicksilver obtained is sold in the Chinese market.

We are now preparing an incline to put in a railroad for bringing down the cinnabar stone for the stamps; we have also got one of Blake's stone-breakers, for breaking the large stones for the stamps.

The houses that are erected by the company for the Englishmen are very good; they are all built with wood, on wooden pillars, from 6 to 8 ft. above the ground. The inhabitants right up their houses in the best manner they can; most of them are on pillars, and covered with leaf (attops) grass.

— *Western Chronicle of Science.*

FOREIGN MINING AND METALLURGY.

The Belgian ironworks continue to experience much difficulty in supplying themselves with raw materials. This is the only check to the prosperity which Belgian metallurgy is otherwise enjoying. The rail rolling-mills have now work assured to them for some time in advance; prices remain firm for all articles. Casting and refining pig has become more scarce. As regards railway *materiel*, the extraordinary activity which has prevailed since September has not slackened, and almost every day brings some fresh contract. Most of the orders received have come from Germany, in which important market Belgian industry appears to have acquired a decided footing, almost all the Belgian firms having orders on hand for that country. At an adjudication for a few locomotives which took place recently at Saarbruck, M. Charles Louis Carels, of Gand, tendered at the lowest price (17,700 thalers each) for two locomotives. The next highest tender was that delivered by the house of Wohlert, of Berlin, which asked for 18,000 thalers per engine. This is the second occasion during the past month on which Belgian industry has triumphed over Germany industry in Germany itself. All the Belgian construction workshops have orders on hand the execution of which will carry them into the middle of 1872. No matter what prices were offered, it would be difficult now to obtain locomotives or trucks in Belgium to be delivered within anything like a brief period. As regards long-termed orders, makers maintain an attitude of reserve, as they anticipate a further advance in prices. Makers who have still some disposable means of action are also reserving their strength for the contracts for rolling-stock about to be let by the Belgian Government to supply the urgent requirements of the Belgian State lines; everything leads to the anticipation that the prices realised on this occasion will be very high, as the makers are, for the moment, masters of the market. The Great Central Belgian Railway Company has abandoned an intention which it recently entertained of letting contracts for rolling-stock by a public adjudication. The company made, instead, direct proposals to several great makers, and we understand that the whole order, comprising 500 trucks and 29 vans, has been let to MM. De Le Court and Co. All available new railway *materiel* finds a ready and rapid sale, and almost all descriptions command a market for the moment. Thus, the Rhenish Railway Company has just purchased at the Nivelles workshops 10 plated vans, for the acquisition of which the administration of the Belgian State lines also made tardy proposals. It is impossible, in short, for the rolling-stock manufacturers of Belgium to be more actively employed than they are at present. The one drawback is the want of means of transport upon the railways, but it is difficult, upon the whole, to make complaints even on this head, as the results of the last season have exceeded all expectations. The Ougrée Blast-Furnaces and Collieries Company will pay a dividend of 1*l.* per share for 1871. The Thy-le-Château Blast-Furnaces and Forges Company will distribute Jan. 2, 1872, 2*l.* per share for 1871. MM. de Wendel have beaten the German houses in a competition at Saarbruck for rails for local German railways.

The production and consumption of coal display the greatest activity in the Belgian basins, although deliveries are greatly impeded by the want of adequate means of transport on the railways, while navigations have also been interfered with by the severe weather which has prevailed. Some descriptions of coal and coke are advancing, and the other qualities remain firm. Freights from Charleroi to Paris remain at 9*s.* 6*d.* per ton, boats being sought after, notwithstanding the temporary check which the navigations have received. During the late frost, navigation on the Sambre, as well as on the Willebroek and Charleroi canals, was completely interrupted. The Couchant du Flenu Colliery Company will pay Jan. 2, 1872, interest for 1871, or 5*s.* per share.

Active efforts are being made by some leading French metallurgists to induce the French National Assembly not to consent to the taxation of raw materials, announced as part of the Government policy by M. Thiers. Representations made personally upon the subject to the veteran President of the Republic are stated to have remained fruitless. A Bill has been declared urgent by the Assembly on the question of railway goods traffic in France; an enquiry is to be made into the whole subject. Prices of most descriptions of iron remain at about the same level; an advance is, however, regarded as imminent. A strike at Brassac has terminated, an amicable understanding having been arrived at between employers and employed.

The Northern of France Railway Company has published a statement defending its conduct in regard to the supply of rolling stock for the conveyance of coal over its system. The company shows that there has been a very large and sudden increase in the coal traffic for which it had to provide, the augmentation for the third quarter of the year having been 242,000 tons. The company also states that when the additional number of coal trucks now being built for it are delivered the increase in its effective supply of rolling stock, as compared with 1869, will not be less than 40 per cent. It is further argued that more goods have been sent recently by railway and less by water; hence an aggravation of the temporary embarrassment which is admitted to exist, but which will soon be provided for. In conclusion, the company observes that it hopes in an early future to overcome all present obstacles. The Paris, Lyons, and Mediterranean Railway Company has addressed a somewhat similar but less explicit letter to the Minister of Public Works. The chief explanation given by the Paris, Lyons, and Mediterranean is that its business has experienced an extraordinary increase, so that for the time it is "materially impossible" to keep pace with it. Severe frost has of late crowned the crisis in the French coal trade, and prices have displayed a decidedly upward tendency.

The French copper markets have presented a considerable amelioration; prices have experienced a sensible advance, and a further upward movement is anticipated. At Paris, English tough cake has made 88*l.*; best selected, 91*l.*; and refined Chilian and Peruvian, 88*l.* per ton. Rolled red copper has made 92*l.*, and yellow ditto 90*l.* per ton. At Havre prices have sensibly hardened; the sale is mentioned of 45 tons at 86*l.* per ton, Paris conditions. At Marseilles transactions have been comparatively rare. The German markets present a good appearance, although they have not displayed quite so much animation of late; the cold weather which has prevailed has deprived business to some extent of the stimulus which it appeared to have received. At Rotterdam quotations for copper have remained without change. The French tin markets have been well maintained. At Paris, Banca tin in ingots has made 162*l.* to 164*l.*; Straits and English have also brought similar prices. In Germany tin displays considerable firmness. At Rotterdam, Banca has slightly receded; there has been scarcely any Billiton on offer upon this important Dutch market. At Paris, French, Spanish, German, English, and Belgian lead has brought about 20*l.* per ton. At Havre soft Spanish, first fusion, has realised 18*l.* 16*s.* to 18*l.* 18*s.* per ton. At Hamburg the price of lead has not varied; the Dutch lead markets have also not experienced any change. There have been considerable transactions in zinc; in Germany, especially, the business passing in the article has been of considerable importance. The present price of the Vieille Montague Company for its rolled zinc is 28*l.* per ton.

MINING ON THE PACIFIC COAST.

AMADOR COUNTY.—The new mill intended for crushing the quartz taken from the Little Amador Mine, at Amador City, is fast reaching completion, and will be ready for operation by the time the winter rains fairly set in.—At Kennedy Mine, after a run of 16 days, the batteries in the mill were cleaned up on Monday last, and the yield realised $6000.

MONTEREY COUNTY.—A rich quicksilver mine has just been discovered at San Juan South. The vein is 6 feet wide, exposing one of the finest bodies of ore ever seen, with a foot of vermillion earth covering the ledge in its entire length. Parties are negociating for the mine for $200,000.

NEVADA COUNTY.—On the Little York Ridge, the Little York Gold and Water Company, since they have purchased the claims, have opened them systematically, and they are now taking out large returns. The claims in the vicinity of You Bet and Red Dog, purchased last year by the English Company, are being prepared for extensive washing this season.

COPE DISTRICT, NEVADA.—Buel and Bateman have run a level along the Tecoma Mine for a distance of about 220 ft., at a depth of 100 ft. from the surface; which show a well-defined vein of high grade ore, from 4 to 7 ft. in width. The Excelsior Company have just completed a Bailey furnace, with a roasting capacity of 20 tons per day. The El Dorado is looking well. This mine belongs to the Excelsior Company. They have a quantity of ore on their dumps awaiting their turn at the furnace. The ores are not only rich in silver, but show $50 per ton in gold. The company from this time forward expect to make monthly shipments of bullion to the amount of $ 5,0 0. The Monitor has some 25 tons of ore on their dumps, worth about $500 per ton. There are a number of other mines in the district, all looking well, and plenty of ore on their dumps.

ELY DISTRICT.—W. F. and Co., shipped, since Nov. 5, 85 bars, valued at $129·046·79. The Stetefeldt furnace was started up on Monday on ore from the American Flag Mine, and, so far as we have learned, has proved a success. Meadow Valley Company's mines are looking well throughout, and the company is shipping the usual quantity of good ore. Raymond and Ely Company's mines looking well, and shipping large quantities of ore to the mill. W. F. and Co. received, from the Meadow Valley Works at Pioche, 14 bars, worth in the aggregate $16,491·68. It goes this morning to New York. They forwarded on the 11th to New York 22 bars from same place, worth $23,098·36. The machinery for the new 30-stamp mill of the Raymond and Ely Company arrived in Salt Lake about two weeks ago, and is now on the way to this place. The Raymond and Ely Company, of Pioche, shipped from Oct. 1 to 31 bullion of the value of $306,814·40.

WASHOE.—We yesterday saw a lot of gold bullion from the Sierra Nevada Mine, valued at about $8000, and worth $12 per ounce. The Savage ore yield for the last week was 475 tons, assaying $31·15 per ton. The bullion receipts for October footed up to $81,000. At Comstock we saw 25 large silver bricks, the greater part from the Crown Point and Belcher Mines, which were worth over $50,000. At Crown Point the drift south at the 1200 ft. level, shows continual improvement, and average assays of the ore from that level run about $48 to the ton. Five mills are now engaged in crushing the ore from this mine.

SOUTH AURORA—WHITE PINE: Last week our report stated that the lower tunnel, running for the purpose of cutting the mineral belt 70 feet below the old workings, had improved in appearance. The same spar body continues in the face of the tunnel. The Mitchell shaft, inside of the old works, is down 70 feet. A drift will be started from it to run south, connecting with the main tunnel mentioned above. After the connection is made, all the ore and waste will pass through it from the different works of the mine. The Turner shaft is down 71 feet. A drift is running south-east to strike the Trewella shaft. At Great Western the new contract in west drift of upper shaft is going on. The ore in sight at present is worth only $6 to $8 per ton, but rich chloride has been found in this locality. At East Sheboygan the ore body has increased since last report in all the drifts, and in the East Exchange incline there is a stratum in the ore body 2 ft. thick, containing horn silver in abundance. The Oxford shaft, started a few weeks ago north of the old openings, is not yet down to ledge matter. After the Oxford is down, other prospecting will be carried north on the same line toward the point where it is proposed to commence the tunnel.

COLORADO.—The total product of our mines for month of October is $73,586·40.

UTAH.—At Little Cottonwood a new body of ore was struck two weeks ago in the Emma, 600 feet from the surface, apparently of great extent. The Flagstaff is shipping more ore than any mine on the hill. The Last Chance, near the top of the hill, is doing a large business in the shipment of ore. The Davenport is looking well, and has furnished considerable ore to the Hawkeye Works in Big Cottonwood. The Raymond and Ely Company disbursed last Friday $130,000 among the stockholders. Nearly 1000 tons of ore were taken from the Chollar Potosi Mine last week, assaying $42·45 per ton. The product from the Hale and Norcross last week was 1250 tons of ore. On November account $82,700 have been received from the Meadow Valley Mine.—*Scientific Press* (San Francisco).

CAMP FLOYD DISTRICT.

We extract the following from a correspondent writing to the *Salt Lake Herald*, under date of Nov. 29:—

Camp Floyd is connected with Ophir by a daily line of stages, run by Wines and Kimball. The distance is about 12 miles by the road; over Lion Hill it is about 6 miles. The mines in this district present many interesting features. The concentrations of minerals are strong, and the outcroppings of the ledges very large. The most noted lodes in this camp that I visited are the Silver Cloud, Mormon Chief, Sparrow Hawk, Silver Star, and Elkhorn; there are probably others which I did not see. The Silver Cloud was recently sold to English parties for a high figure. There is a large force of men at work on it, making extensive preparations for the future working of the mine. The outcroppings on the ledge are very prominent. There is a shaft sunk on the Cloud about 85 feet, and then a drift run out from this shaft upwards of 60 feet in length. I made a careful examination of the ores taken from this mine, there being in the neighbourhood of 50 tons on the dump. All appeared to be of the best quality of chloride, with very little base matter in view; and I saw half a wagon load of ore freely intermixed with large flakes of horn silver. My companion, while examining these ores—and he was a gentleman who had large mining experience in Mexico and South America, and had passed through a very varied mining experience on the Pacific since 1849—remarked as he took up one of these chunks of horn silver that he had never seen such a sight before in his life. They are shipping from this mine, as I was informed by the workmen, half-a-dozen six-mule wagon loads of ore per day. It will take a great deal of argument to convince me that the Silver Cloud is not one of the best mines in Utah. The vein is large and compact so far as developed, ore appearing to be uniformly interspersed in the gangue.

The Silver Star is on the western extension of the Silver Cloud; and, although not so well developed as the Cloud, it yet gives evidences both interiorily and exteriorily of being equally valuable.

The Mormon Chief lode outcrops in a semi circle on the face of the hill, commencing with the Last Chance, Sparrow Hawk, and Marion (the Mormon Chief being in the middle), and ending with the Morrow ledge, so-called. The ledge is about 3½ miles in length. The outcroppings on it are uniformly prominent, and very strong to the eye of a practical miner. It is, indeed, a monster ledge, and my opinion is that the owner of feet in it has something that will do to tie to. I believe the Sparrow Hawk, Last Chance, and Marion have recently been sold in London; the exact amount I do not know. The Mormon Chief was sold some time ago to parties, I believe, in Omaha, and afterwards re-sold in London, as I have been informed. These lodes are pretty thoroughly developed, showing large bodies of chloride ore freely interspersed throughout the gangue. Unprejudiced minds cannot but pronounce these mines as possessing great mineral wealth. I understand that the owners of the Silver Cloud, as also the Sparrow Hawk, are about erecting large mills near their mines. If so, and the capacity of the mill is commensurate with the capacity of the mines for yielding rich chlorides, I see little to hinder Camp Floyd district from becoming a very flourishing mining camp.

THE EMMA MINE, UTAH.—The *New York Times* publishes the following among its items of Washington news:—

"One hypothesis on which certain papers demanded the recall of Minister Schenck for his connection with the Emma Mine speculation is that the company which advertises the stock, and of which General Schenck is announced to be a director, is a bogus and swindling concern. Enquiries at the General Land Office here and of persons having information result in establishing the fact that the mine is one of great value, and the enterprise is undoubtedly legitimate. The Emma Mine, as it is called, is in the Cottonwood Canon, about 25 miles from Salt Lake City. This canon is famous for the number of its valuable mines of lead and silver. Nearly all the ore obtained in the canon is argentiferous galena, some of it being valuable only for lead, and some of it being exceedingly rich in silver. The ore is found in what are called pockets, and not in lodes or fissures. The Emma Mine has been worked for several years, and to all appearance is as inexhaustible as it is rich. The discoverer opened one shaft, and worked it till apparently all the ore had been taken out; but another miner, having confidence in some evidences of additional ore he found by careful examination, bought the claim, and soon after came upon the deposit now being worked, and which is unexceptionably valuable. It may "peter out," as the miners say, but there is the same risk in some degree to be run with all the mines. The patent was issued at the Land Office in the latter part of August last; the claim had been pending for some time previous. In response to the legal notices of application for a pet patent an adverse claim was filed, and, in accordance with law, the case was ordered into court for a judicial decision of the rights of the different claimants; but before the case came to trial the adverse claim was withdrawn and the patent was issued. Senators Nye and Stewart had been interested on opposite sides of the dispute. Nye favoured the first claimant and Stewart the opposite side, and Judge Poland, of Vermont, was attorney for the claimants. He and Mr. Stewart came here together when the adverse claim was withdrawn, and immediately upon the issue of the patent Stewart left for Europe. It is understood he had delayed his visit while attending to the case, and it is inferred that he went abroad in the interest of the company. The patent was not issued to the company which now holds it, but to the individual locators, of which there were 11; 200 feet to each locator and 200 for the right of the discovery made 2400 linear feet, for which the patent was issued. The names of the locators are in the patent, but General Schenck's name does not appear upon the record, and it is understood that the company bought of the original patentees, possibly the arrangement having been made prior to the obtaining of the patent. Had the company taken the patent a list of its stockholders and officers would be on file here. There is talk of building a railroad from Salt Lake City to the canon for the use of all the mines. The whole region is now covered with snow 4 feet or 5 feet deep.

THE PROPOSED AMALGAMATION OF THE EBERHARDT AND SOUTH AURORA MINES.—It will be recollected that at the first general meeting of the South Aurora Mining Company (the details of which appeared in the Journal of Nov. 4) a committee of shareholders was appointed to confer with the directors upon the position and prospects of the company, and to report to an adjourned meeting, to be held on Jan. 4. Mr. T. G. Taylor (a member of the committee) in his monthly circular states that since their appointment meetings have been held on alternate days, and proposes as the best mode of working the Eberhardt and South Aurora Mines hereafter will be by an amalgamation of the interests of the two companies, taking as a basis something like the market value of the respective shares. Mr. Taylor suggests that as the Eberhardt and Aurora Company has a registered capital of 500,000*l.*, of which more than 200,000*l.* is as yet unappropriated, it can offer the South Aurora Company 150,000*l.* for its property and rights, which consist now, or will consist, of four mines, one mill, and water right, which are represented by a paid-up capital of 300,000*l.* They must write off 150,000*l.* of this as an over valuation, and consequent loss. The South Aurora Company must be liquidated, and the Eberhardt and Aurora Company purchase its rights and possessions by paying to each holder of four South Aurora shares one Eberhardt and Aurora share. If the richest ores in North Aurora and Ward Beecher are really smothered by the fall of over 100 feet of poor or non-paying rock, the debris may be discharged at least expense through a lateral tunnel from the Chloride Flat, and the rich ores more economically through the same adit. At present the South Aurora interposes between the three best mines of the Eberhardt and Aurora Company. Should this proposal be carried out, the result will be that from nine mines grouped together the richest ores may be most conveniently worked by three powerful mills of 100 stamps aggregate power; tunnelling will save sinking when the levels are connected; existing shafts will give ventilation, hoisting and twice handling of ores will be partially avoided by tramways; there will be no dispute about water rights; and the economies arising from one direction and office in London, and one management in Nevada will be considerable; while the average profits from working on a good system so many mines in connection will enhance the value of the shares and the amount of future dividends; and, in fact, place the united company, if prudently managed, almost above the chances of fortune.

FOREIGN MINES.

MONTE ALBO.—W. Martin, Dec. 6: Su Ergiolu: The new shaft is being sunk below the No. 4 level by nine men; the lode is 1 metre wide, and will yield for size of shaft 1¼ ton of lead ore per metre.—Stopes in back of No. 4 level: No. 1 is yielding ¾ ton of ore per metre; No. 2 on footwall side of the lode is also yielding ¾ ton per metre; and No. 3, on hanging wall side, 1 ton per metre.—Guzurra Mine: The Julius Cæsar cross-cut is being continued; the ground has changed considerably during the past month, and is now favourable for driving. The winze in bottom of Julius Cæsar level, on course of lode, has attained the depth of 14 metres, and the men are now driving on the lode, which is at present poor, letting out a little water. Driving west on the course of lode A, from this level, the lode is poor; we hope to communicate this point with the winze sinking in bottom of Santa Clare level by the end of this week.—The stopes in back of Julius Cæsar level: No. 1, east of Santa Maria shaft, yields ¾ ton per metre; No. 2, west of same, ¼ ton per metre; and No. 3 west ⅛ ton per metre. The Napoleon level is being driven on the course of the lode by three men; it is favourable for driving, and letting out a little water, but is poor at present. A stope in back of this level is yielding ⅓ ton of ore per metre. Galleria Nuova is being driven by three men; the lode is 70 centimetres wide, composed of quartz, blende, and good stones of lead ore. As soon as we have holed the winze under Santa Clara level, on lode A, we shall commence to stope the back of this level.

JAVALI.—The directors are in receipt of advices from Capt. Johns (the manager), dated Javali Mine, Nov. 6, by which they learn with much regret the death of Dr. Berthold Seemann (the managing director), which occurred on Oct. 10. The following are extracts from the report:—"I think that we shall this month meet with one of the richest parts of the mine. The place where the old owner, Don Lucas Quiroz, extracted before he sold the mine 400 ozs. in three weeks only by the common arrastras system; it is well known by all the gentlemen who have inspected the mine under the name of La Cocira de Don Lucas (the kitchen of Don Lucas). I have the pleasure to send you again a very satisfactory remittance—750 ozs. of gold, the result of 38 days' working, crushing 2160 tons of quartz, yielding an average of 7 dwts. per ton. The mill has worked without any accident, and had not the death of Dr. Seemann have caused a few days stoppage we would have exactly the same result as last. I have agreed with Mr. Belt to build the reservoir the next dry season; we have already commenced to clear the ground. The expenditure this month has been $2645·58; for September it was $3784·64: together, $6429·22, or 1285*l.* 15*s.* 9*d.*, against the remittance valued at 1750*l.* leaves a clear profit of 464*l.* 4*s.* 3*d.* We have sufficient labour, and the health of the district is as usual. In conclusion, I can assure you that everything looks very satisfactory."

ECLIPSE (Gold).—Mr. Henry Tregellas, Nov. 18: We have stamped since last report 130 tons, from which we have taken about $2100, and I am satisfied that when we concentrate our sand or tailings properly we can obtain at least one-fourth more gold and silver from the same quantity of quartz. We are, however, concentrating in the meantime on blankets and strakes, but shall erect two buddles for that purpose; the whole ironwork for same is on hand. During the past two crushings we have not averaged 15 stampers running, solely on account of not being able to get quartz enough hauled by teams, hence why no more tons of quartz have been stamped. I hope we will in future be able to keep the 30 stampers stamping, as after a day, or perhaps two, that we will require to timber up our tunnel for the outlet of water from turbine water-wheel pit, this being done, we shall start up the 30 stampers, and the tramroad being far advanced towards completion, I anticipate no trouble in supplying the mill. The smelting works are proceeding satisfactorily, having overcome all difficulties in obtaining proper lime, &c. The works are being pushed as fast as possible. Thus one difficulty after another disappears before perseverance. Our mill works highly, and we have all the water we require. The river has commenced to rise, so there is no fear of again being short of water.

COLORADO TERRIBLE LODE.—The Secretary has forwarded the following particulars, gathered from the agent's report for October:—Produce for October, 7 tons of first-class ore, 80 tons of second-class ore, and 70 tons of third-class ore. Quantity and value of ore on hand Oct. 31, including ore in course of sale, transit, and at the mine—44 tons of first-class ore, valued at $600 per ton net, $26,350; 328 tons of second-class ore, valued at $100 per ton net, $32,800; 214 tons of third-class ore, valued at $20 per ton net, $4280=$63,430. From which is deducted, to cover all current expenses to October 31, $32,000: balance $31,430—equal, at 3*s.* 9*d.* per dollar, to 5893*l.* 2*s.* 6*d.*: showing, in addition to a dividend of 2*s.* per share already paid, the profit on seven months' operations to October 31.

SILVER PLUME.—The directors have received advices of the arrival at Liverpool of another 5 tons of silver ore, per steamer Colorado.

NORTH AMERICAN (Gold).—Telegram from San Francisco, dated 13th inst.:—"North American new tunnel developing exceedingly rich gravel; large yield certain."

WEST CANADA.—Nov. 24: At Wellington Mine the two stopes, east of Rowe's shaft, are yielding 2½ tons of ore per fathom each; and the stope in the bottom of the 35, east of Bray's shaft, will yield 3 tons per fathom.—Huron Copper Bay: In the 60 fm. level, east of Bray's shaft, the lode is 4 feet wide, and will yield 1⅛ ton per fathom. The cross-cut north at the 50, west of Palmer's shaft, is without change since last reported on. The stope in the bottom of the 50, west of the same shaft, has improved, and now yields 2¼ tons per fathom. The stope above this level is suspended for the present, the men having gone to other bargains in places of miners left. The lode in the stope above the 35, west of Palmer's shaft, will yield 3 tons per fathom. In the stope in the bottom of the 35, east of Bray's shaft, the lode yields 2½ tons per fathom; and the stope under the same level, west of Bray's shaft, on Fire lode gives 2½ tons per fathom.

[For remainder of Foreign Mines see to-day's Journal.]

CHEMICALS AND MINERALS.—Messrs. J. Berger Spence and Co., Manchester, Dec. 20.—For spelter there is a largely increased demand. A long time ago we noticed its employment at Birmingham in some degree to the displacement of tin, and now that tin has advanced so much in price the real value of spelter is beginning to be felt. Hamburgh is ice-bound, which helps present prices. Rolled zinc has realised 26*l.* 15*s.* Exports of quicksilver this year have been greater than imports; no reduction of price is, therefore, to be expected. There is a movement in nickel, upwards. Bismuth and nickel are both scarce. Antimony has risen to 51*l.*—Soda: Cream caustic, firm, at 14*l.* 10*s.*; white, 60 per cent., 15*l.* to 15*l.* 10*s.*; soda ash, 2¼*d.* to 2½*d.*; soda crystals, fair demand, at 5*l.* 7*s.* 6*d.* to 5*l.* 10*s.*; bi-carbonate, 13*l.* 10*s.*; salt-cake, 8*l.* 17*s.* 6*d.* to 4*l.*; Glauber salts, 3*l.* 7*s.* 6*d.* to 4*l.*—Borax, refined, 95*l.*—Nitrate of Soda: Little doing, 16*l.* 10*s.*—Potash: Muriate, 80 per cent., at 10*l.* 15*s.* to 11*l.*, f.o.b.; Prussiate, red, 3*s.*; yellow, 1*s.* 9*d.*; chlorate, 1*s.* 6*d.*; bi-chrome, 10*d.*⅛; potashes, 44*s.* to 44*s.* 6*d.*; pearl ashes, 50*s.* per cwt.—Saltpetre: Foreign, 30*l.* to 33*l.*; refined, 37*l.* to 38*l.*—Alum: At 6*l.* 10*s.* to 7*l.* for loose lump; in export barrels, 7*l.*; ground, 7*l.* 10*s.*—Bleaching Powder: At 12*l.* 5*s.* to 12*s.* 10*d.*—Ammonia: Sulphate, white and grey, 23*l.* 10*s.* to 24*l.*; brown, 15*l.*; carbonate, 7*d.*; muriate, 28*l.* to 30*l.*; sal ammoniac, 1st, 46*s.*; 2nd, 45*s.*—Iron Salts: Green and rusty copperas, 55*s.*; dry Copperas, 52*s.*—Copper Salts: Sulphate of copper, 38*l.*—Arsenic: At 6*l.* 15*s.* to 7*l.*, for white powdered.—Acid: Tartaric, strong, at 1*s.* 6½*d.* to 1*s.* 6¾*d.*; oxalic, 1*s.* 1*d.*; sulphuric, 3*l.* 10*s.* to 3*l.* 15*s.*; carbolic, 1*s.* 2*d.* to 1*s.* 3*d.*—Magnesia: Epsom salts, at 4*l.* 10*s.* to 4*l.* 17*s.* 6*d.* for refined.—Oils: spindle, loom, and dense oils, at 4*s.* 6*d.* to 6*s.*; Olive, 47*l.* to 52*l.*; Pure white Norwegian cod liver oil, 4*s.* 6*d.* to 6*s.* per gallon.—Pitch: At 13*s.* to 15*s.*—Benzole: Unchanged, 30 per cent., 3*s.* to 3*s.* 6*d.*; 50 per cent., 3*s.* 6*d.* to 4*s.*; 90 per cent., 4*s.* 6*d.* to 5*s.*—Disinfectants: Patent, 5*l.*; carbolic acid, 10*l.*—China Clay: 22*s.* per ton.—Pyrites: Spanish, cupreous, 8*d.* to 8½*d.*; non-cupreous, 10*d.*—Phosphates: Super-phosphates, 25 to 30 per cent. 3*l.* 10*s.*; precipitated phosphate of lime, 40 to 50 per cent., 5*l.* 10*s.* to 6*l.* 10*s.*; Estremadura, 1*s.* 3*d.*; mineral, 50 to 60 per cent., 11*d.* to 1*s.* per unit.—Manganese: Ores, 115*s.* to 120*s.* for 70 per cent.; demand still improving.—Iron Ores: Hematite, 20*s.* to 25*s.*; Oolitic, 6*s.* 9*d.* to 7*s.* 6*d.*

SAVING IN FUEL.—Messrs. Smith and Sons, of Barnard Castle, have recently introduced a very novel stove, which it is stated effects an enormous saving in fuel. In ordinary Gill stoves a vast amount of heat is wasted up the chimney. Messrs. Smiths' object, in the construction of their stove, is to expose as large an area of heating surface as possible for a given quantity of fuel to the influences of the fire and the air, so as to derive heat from the one and impart it to the other in the maximum degree attainable. This is done by the introduction of tubes or flues in their stove, through which the heated air and products of combustion pass from the fire-box before entering the chimney. Between these tubes are passages to which the air has free access. This air, as it becomes heated, naturally becomes lighter, and so ascends, making room for a continued rush of cool air to supply its place; so that, in a few hours the whole air of the room has entered the passages, and so become heated. The stove is also provided with a valve for regulating in case of over-heating.

TANGYE BROTHERS AND HOLMAN,

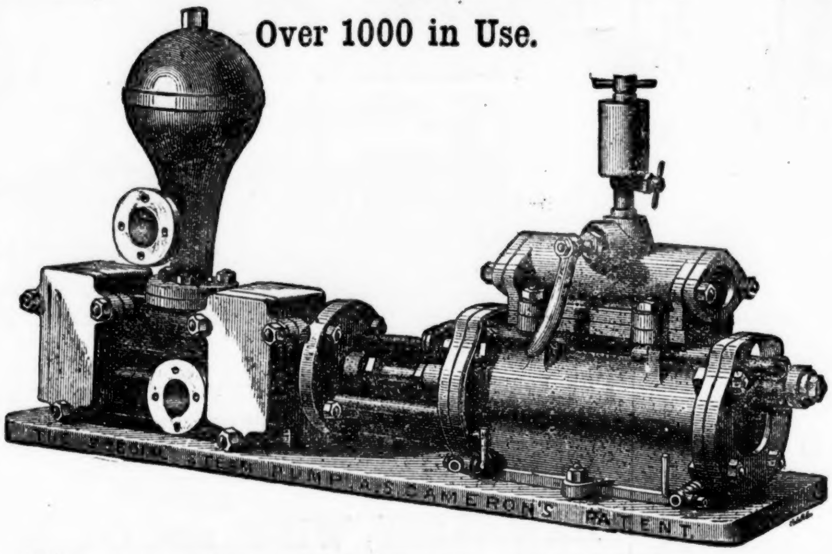
10, LAURENCE POUNTNEY LANE, LONDON,

CORNWALL WORKS (TANGYE BROTHERS), BIRMINGHAM,

SOLE MAKERS OF

THE "SPECIAL" STEAM PUMPS.

Over 1000 in Use.



IN USE AT THE FOLLOWING QUARRIES:—

Carnarvon and Bangor Slate Co. ... 5 Pumps.
Kellow, J. E., North Wales Slate Co... 1 „
New Zealand Quartz Crushing and Gold Mining Company... ... ... 1 „
Scott, R. W., Dungannon, Ireland ... 1 „
Foster, J. S., Hebburn Quarries ... 1 „

IN USE AT THE FOLLOWING CHEMICAL WORKS:—

Alum and Ammonia Co., Bow Common 2 Pumps.
Barnes, W. C., Hackney Wick... ... 2 „
Burt, Boulton, and Hayward, Tar Works, Millwall ... ... 1 „
Cory and Co., Manor-street, Old Kent-road ... ... 2 „
Whiffen, Thomas, Battersea ... ... 1 „
Jones, W., and Co., Middlesborough... 4 „
Jarrow Chemical Co., South Shields.. 1 „
Richardson, J. G. and N. H., Jarrow-on-Tyne ... ... 1 „
Read, Holliday, & Sons, Huddersfield 1 „
Sheldon, Nixon, and Co., West Jarrow 2 „
Tennant, C., and Co., near Newcastle. 7 „
Webb, H., & Co. (Manure), Worcester 1 „
Union Chemical Company, Stratford.. 1 „

NOTE,

Requires NO Shafting, Gearing, Riggers, or Belts.

All Double-Acting:

Works at any Speed, and any Pressure of Steam.

Will Force to any Height.

Delivers a constant stream.

Can be placed any distance away from a Boiler.

Occupies little space.

Simple, Durable, Economical.

IN USE AT THE FOLLOWING COLLIERIES:—

Adelaide Colliery, Bishop Auckland ... ... 3 Pumps.
Acomb Colliery, Hexham ... ... 1 „
Blackfell Colliery, Gateshead ... ... 1 „
Black Boy Colliery, Gateshead ... ... 1 „
Castle Eden Colliery ... ... 2 „
Crofton, J. Ct., near Ferryhill ... ... 1 „
Carr, W. C., Newcastle ... ... 4 „
Etherley Colliery ... ... 1 „
Gidlow, T., Wigan ... ... 3 „
Haswell, Shotton, and Easington Coal Co. ... 2 „
Lochgelly Iron and Coal Company ... ... 1 „
Leather, J. T., near Leeds ... ... 2 „
Lumley Colliery, Fence Houses ... ... 1 „
Monkwearmouth Colliery, Sunderland... ... 1 „
North Bitchburn Colliery, Darlington ... ... 2 Pumps.
Newton Cap Colliery, Darlington... ... ... 1 „
Normanby Mines ... ... 1 „
Oakenshaw Colliery ... ... 1 „
Pease's West Colliery ... ... 2 „
Pease, J. and J. W., near Crook ... ... 5 „
Pease, J. and J., Brandon Colliery ... ... 1 „
Pegswood Colliery, near Morpeth ... ... 2 „
Pelton Fell Colliery ... ... 1 „
Railey Fell Colliery, Darlington ... ... 1 „
Right Hon. Earl Durham, Fence Houses ... 1 „
Skelton Mines ... ... 1 „
South Benwell Colliery ... ... 4 „
St. Helens (Tindale) Colliery ... ... 1 „
Stott, James, and Co., Burslem ... ... 1 Pumps
Seaton Delaval Coal Company, near Newcastle 1 „
Thornley Colliery, Ferryhill ... ... 1 „
Thompson, John, Gateshead ... ... 2 „
Trimdon Grange Colliery ... ... 1 „
Tudhoe Colliery ... ... 4 „
Vobster and Mells Colliery ... ... 2 „
Widdrington Colliery, Morpeth ... ... 2 „
Whitworth and Spennymoor Colliery ... ... 3 „
Westerton Colliery, Bishop Auckland ... ... 1 „
Wardley Colliery, Gateshead ... ... 1 „
Westminster Brymbo Coal Company ... ... 2 „
Weardale Coal and Iron Company ... ... 5 „

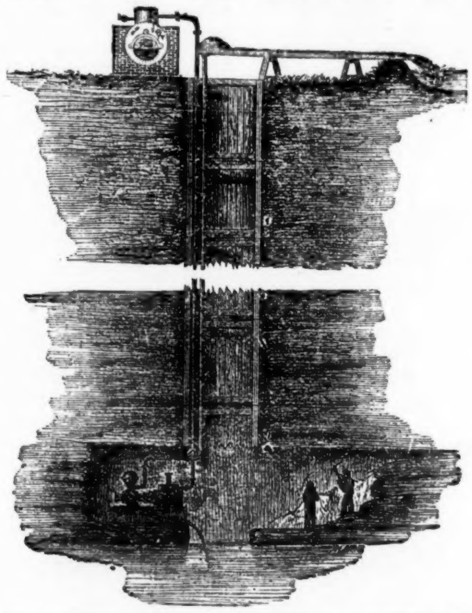
IRONWORKS AND ROLLING MILLS:—

Bede Metal Company, Jarrow ... ... 11 Pumps.
Bagnall, C. and T., Grosmont Ironworks ... 2 „
Consett Ironworks ... ... 2 „
Castleford Foundry Company, Normanton ... 1 „
Ellen Rolling Mills, Maryport ... ... 1 „
Gilkes, Wilson, Pease, and Co , Middlesboro' .. 2 Pumps.
Lloyd and Co., Middlesborough ... ... 1 „
Solway Hematite Iron Company, Maryport ... 1 „
Vaughan, Thomas, Middlesborough ... ... 2 „
The Shotts Iron Company, Edinburgh ... ... 1 „
Whitwell and Co., Stockton ... ... 3 Pumps
Whessoe Ironworks, Darlington ... ... 1 „
West Cumberland Hematite Iron Company ... 1 „
Westbury Iron Company ... ... 1 „

THE "SPECIAL" STEAM PUMP AS APPLIED FOR DRAINING MINES.

The arrangement in the accompanying illustration shows an economical method of draining mines without the expense of erecting surface-engines, fixing pump-rods, or other gearing. A boiler adjacent to the pit's mouth is all that is necessary on the surface; from thence steam may readily be taken down, by means of a felted steam-pipe, to connect the pump with the boiler. The pump may be placed in any situation that may be convenient for working it, and connecting the steam, suction, and delivery pipes.

These engines can be fixed and set to work in a comparatively short time, and also at a very small outlay. They are used in large mines as auxiliary engines, and will be found invaluable adjuncts in all mining operations.



To estimate the quantity of water to be raised by any given size of pump refer to the tabulated list below. It is recommended to use long-stroke pumps where the height exceeds 100 ft., so that the largest result may be obtained with a minimum wear and tear of the pump pistons and valves. The pumps are provided with doors for ready access to all working parts.

PRICES OF THE "SPECIAL" STEAM PUMPS.

Diameter of Steam Cylinder ....inches	2¼	3	4	4	6	6	6	7	7	7	8	8	8	8	10	10	12	12	14	16	26
Diameter of Water Cylinder ....inches	1¼	1½	2	4	3	4	6	5	6	7	4	6	7	8	6	7	8	10	8	7	6½
Length of Stroke ....inches	6	9	9	12	12	12	12	12	12	12	12	12	12	18	12	12	18	24	48	24	72
Strokes per minute	100	100	70	50	50	50	50	50	50	50	50	50	50	35	50	50	35	—	—	—	—
Gallons per hour	310	680	815	3250	1830	3250	7330	5070	7330	9750	3250	7330	9750	13,000	7330	9750	13,000	—	—	—	—
PRICE..	£10	£15	£20	£35	£30	£40	£47 10	£50	£52 10	£57 10	£50	£55	£65	£85	£70	£80	£100	—	—	—	—

IF BRASS LINED, OR SOLID BRASS OR GUN-METAL WATER CYLINDERS, WITH COPPER AIR VESSELS, EXTRA, ACCORDING TO SIZE.

Any Combination can be made between the Steam and Water Cylinders, provided the Lengths of Stroke are the same, thus—8 in. Steam and 3 in. Water, or 10 in. Steam and 3 in. Water, adapted to height of lift and pressure of steam, and so on.

TANGYE BROTHERS & HOLMAN, 10, Laurence Pountney-lane, London, E.C.

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